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PART II

ENVIRONMENTAL PROTECTION AGENCY

■

AIR QUALITY SURVEILLANCE AND DATA REPORTING

Proposed Regulatory Revisions

[6560-01]

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Parts 51, 52, 53, 58, 60]

[FRL 907-1]

AIR QUALITY SURVEILLANCE AND DATA REPORTING

Proposed Regulatory Revisions

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: This notice proposes to revise the requirements for ambient air quality monitoring for purposes of the State implementation plans (SIP's) and for reporting air quality data to EPA as required by section 110(a)(2)(C) of the Clean Air Act (act). The new regulations would be in a new part 58 entitled, "Ambient Air Quality Surveillance." This new part would contain the requirements and criteria concerned with ambient air monitoring. Also included in the new part 58 would be provisions which would address other requirements of the act including provisions for monitoring criteria and air quality index reporting as required by section 319, "Air Quality Monitoring"; provisions for data reporting which would enable EPA to satisfy the requirements of section 313, "Additional Reports to Congress"; and provisions for public notification of information related to air quality standards violations which would satisfy the requirements of section 127, "Public Notification."

DATES: Comments must be received on or before October 6, 1978.

ADDRESSES: Send comments to: Robert Neligan, Director, Monitoring and Data Analysis Divison (MD 14), Office of Air Quality Planning and Standards, Environmental Protection Agency, Research Triangle Park, N.C. 27711.

FOR FURTHER INFORMATION CONTACT:

William M. Cox, Monitoring and Data Analysis Division (MD 14), Office of Air Quality Planning and Standards, Environmental Protection Agency, Research Triangle Park, N.C. 27711, 919-541-5312.

SUPPLEMENTARY INFORMATION:

Background

On August 14, 1971 (36 FR 15486), the Administrator of the Environmental Protection Agency promulgated regulations for the preparation, adoption, and submittal of State implementation plans (SIP's) under section 110 of the Clean Air Act, as amended. These regulations included requirements for States to establish and operate networks of ambient air monitoring stations and to report the resulting data to EPA. The data were to be used, among other things, for developing control strategies, in tracking attainment and maintenance of national ambient air quality standards (NAAQS), and in analyzing air quality trends.

In October 1975, at the request of the Deputy Administrator of the Environmental Protection Agency, a Standing Air Monitoring Work Group (SAMWG) was established. The Work Group was to critically review and evaluate current air monitoring activities and to develop air monitoring strategies which would be more cost effective, help to correct identified problems, improve overall current operations, and adequately meet projected air monitoring goals. Members of the Work Group represent State and local air pollution control agencies and EPA program and regional offices.

SAMWG's review indicated that the current ambient monitoring program is basically effective in providing information for support of SIP activities. Several areas, however, were identified where deficiencies existed and needed correction. The principal areas where corrections are needed are summarized below.

1. In some cases, data are being reported to the EPA central data bank from more stations than are absolutely necessary for adequate national control programs assessments and pollutant trends analysis.

2. Existing regulations coupled with resource constraints do not allow State and local agencies sufficient flexibility to conduct special purpose monitoring studies.

3. Resource constraints and diversity of the data needs frequently result in untimely or incomplete reporting of air quality data. Adequate air quality data for national problem assessments and routine trend analysis are in some cases not available to agency headquarters until 12-18 months after each calendar quarter.

4. Lack of uniformity in station location and probe siting, sampling methodology, quality assurance practices, and data handling procedures have resulted in data of unknown quality.

The recommendations of SAMWG are intended to correct the deficiencies listed above. These recommendations are contained in a strategy document, "Air Monitoring Strategy for State Implementation Plans," EPA 450/2-77-010, U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711, June 1977. This document has been distributed to State and local air pollution control agencies and is available for public inspection at the Public Information Reference Unit, Environmental Protection Agency, 401 M Street SW., Washington, D.C. 20460. The revisions being proposed today are intended to implement the recommendations contained in the SAMWG strategy document.

The revisions being proposed today also respond to certain requirements of section 319 of the Clean Air Act. This section, which was added to the act on August 7, 1977, essentially requires the development of uniform air quality monitoring criteria and methodology, reporting of a uniform air quality index in major urban areas, and the establishment of an air quality monitoring system throughout the United States which utilizes uniform monitoring criteria and provides for monitoring stations in major urban areas that supplement, but not duplicate, State monitoring. Section 319 also provides that EPA or some other Federal agency or department will monitor air quality in major urban areas where States fail to provide the necessary monitoring. EPA does not believe that a federally run monitoring system will be necessary for pollutants now regulated under State implementation plans. EPA believes that the monitoring network provided for in the State implementation plan, when fully implemented, would be adequate for this purpose since the network would: (1) Be operated in adherence with uniform quality assurance and monitor siting criteria and use EPA approved methods, and (2) be of sufficient size and distribution to preclude the need for supplemental Federal monitoring. Also, under non-SIP related requirements, States would carry out the requirements for daily air quality index reporting. EPA intends to limit direct Federal monitoring for pollutants for which NAAQS are established to those few cases where States are unable to comply with these requirements. Any one desiring a public hearing on the revisions being proposed today, specifically those associated with the requirements of section 319, should contact Mr. William M. Cox at the address previously noted. Public hearings will be scheduled if significant interest is demonstrated.

Regulatory Revisions

A new 40 CFR part 58 entitled "Ambient Air Quality Surveillance" would be created to include most of the regulatory requirements dealing with air quality monitoring. The creation of this new part is for the purpose of consolidating ambient air quality monitoring requirements. Part 51 would not be an appropriate place for such a consolidation because the proposed regulations contain certain requirements which are not related to the SIP's.

The uniform air quality criteria which are being proposed as a result of both the SAMWG recommendations and section 319 relate to four major areas; quality assurance, monitoring methodology, sampling interval, and siting of instruments and instrument probes. The section 319 requirements for a uniform air quality index would be implemented by including in the new part 58 provisions for daily reporting of an air pollution index in major urban areas. Provisions for Federal operation of monitoring stations would also be included in the new part 58. Detailed discussions of these provisions are included below.

The monitoring criteria, as well as other detailed and lengthy material, appears in appendices to part 58. The appendices are as follows:

Appendix A—Quality Requirements for State and Local Air Monitoring Stations (SLAMS).
Appendix B—Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring.
Appendix C—Ambient Air Quality Monitoring Methodology.
Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS).
Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring.
Appendix F—State and Local Air Monitoring Stations (SLAMS) Air Quality Annual Report.
Appendix G—Uniform Air Quality Index and Daily Reporting.

Section 51.17, air quality surveillance, which currently contains the requirements for an ambient air quality monitoring network for purposes of the SIP, would be revoked and replaced by requirements in part 58. The new requirements would provide for a SIP network of State and local air monitoring stations (SLAMS). It is intended that the new requirements provide enough flexibility that the SLAMS network could be evaluated on an annual basis and modified to meet changing data needs by adding, deleting, or relocating monitoring stations. It is also the intent that the majority of SLAMS networks be smaller than the currently existing monitoring networks which are described in or associated with the SIP's. Reducing the number of stations in the SLAMS network to only those that are truly necessary for SIP purposes should free some stations which the State could use for special studies for unspecified periods of time.

The additional stations not in the SLAMS network would be identified as special purpose monitoring (SPM) stations and would not be subject to any EPA requirements unless data were used for SIP purposes. More detail is provided concerning SPM stations under the discussion of the revisions.

The SLAMS data would be reported to the national air data bank (NADB) in the form of a summary report on an annual basis. This would eliminate the requirement currently in § 51.7, Reports for all individual data values to be repoted quarterly. Data use by the regional offices, however, differs from the NADB requirements. Reporting of individual data values to the regional office would be on the basis of agreements between the regional office and the State, depending on specific data needs in that region.

To provide EPA with timely data upon which to base national assessments and trends analysis, a national monitoring network would be established. This is in keeping with the intent of section 319 of the Clean Air Act. The national network would be operated by the States and would actually consist of certain select stations out of the SLAMS networks from which individual data values would be reported quarterly to EPA. As well as remaining as SLAMS, and continuing to be subject to the annual SLAMS summary reporting requirements, these stations would also be identified as national air monitoring stations (NAMS).

The number of stations in the State's NAMS network would be far less than are currently in the State's SIP network. The total reporting requirements of these proposed regulations, including the annual SLAMS report, would therefore be reduced from the current requirements for quarterly reporting of all data from all stations.

Resources

The initial intent of SAMWG was to correct deficiencies and develop a new monitoring strategy which would result in a more cost-effective use of ambient monitoring resources. It was intended that this would be done by designing a new SIP network consisting of only those stations considered necessary for SIP purposes. Fewer stations would be in the network thereby reducing the required operation and data reporting costs. After developing the quality assurance program, however, it became apparent that the efforts necessary to quantify the precision and accuracy of data and to ensure that only high quality data are collected and reported may go well beyond what many State and local agencies are currently doing. The result is that new or redirected resources may be needed for these agencies in order to fully implement the quality assurance program. Although resource intensive, the quality assurance program is felt to be entirely justified considering the economic impact of decisions based on ambient air quality data. Also, while initial resource requirements may be high, after the program gets underway it is anticipated that fewer resources will be needed to continue the quantification of precision and accuracy.

Considering that in some instances the new regulations may actually require significant additional resources, completion of the NAMS network would not be required until January 1, 1981, while completion of the full SLAMS network would be required two years later on January 1, 1983. Also, in order to reduce the impact on resources, flexibility exists concerning how many stations need be in the SLAMS network, and the annual review provisions would allow network modifications from year to year as resources or other factors dictate.

Historical Data Use

As the intent of the regulations (i.e., better quality data) is realized, some consideration should be given to the proper use of the previously collected data. Whereas uncertainties may be associated with the accuracy of the previous data, the question is whether these data are better than no data at all. Failure to use historical data would eliminate the possibility of documenting trends in air quality and would place control agencies in an impossible situation in assessing the results of control strategies.

In those instances when data are known to be biased, caution should be exercised when using the data depending on the extent of the bias. If there is no known bias but data validity is still uncertain, average values or various percentiles could still be useful for trend purposes. In general, data should be ignored only when they are known to be so inaccurate that it would be better to have no data at all. Thus, use of historical data should depend on the degree to which their validity or inaccuracy can be established and on their intended use.

Data Storage

EPA recognizes that some of the States do not have facilities for storing ambient air quality data. Accordingly, the NADB, or any regional office facilities, would be available for storing the State's data. Allowing the State the use of EPA facilities, however, would not constitute meeting the annual summary data reporting requirements for the SLAMS data. An annual summary would still have to be submitted with a verification of data accuracy as is required by these proposed regulations.

Additional Actions

The bulk of the revisions being proposed today are concerned with monitoring and with reporting of air quality data. The only other major revisions being proposed would change the

source emissions report now in § 51.7 from a semi-annual report to an annual report and would add requirements for reporting of lead and lead compound emissions. The decision to include lead emissions reporting requirements was made since the regulations requiring a lead SIP are being developed concurrently with these regulatory revisions.

It is anticipated that the lead regulations will be promulgated several months before these monitoring and reporting regulations. Since the first emissions report, which would be for calendar year 1979, would not be required until July 1, 1980, the reporting requirements for lead emissions are being included in today's package with other emissions reporting revisions. Air quality surveillance requirements for lead, however, are being included in the lead package since they take effect immediately upon promulgation. This procedure will also allow those persons interested in commenting on the lead regulations to see all the proposed regulations, other than emissions reporting, in one package. The lead air quality surveillance requirements will be incorporated without substantive change into the final promulgation of the air quality surveillance regulations being proposed today.

The requirements for reporting emissions and State actions that are currently in § 51.7 would appear in a new Subpart Q—Reports, in part 51. An addition would be made to these reporting regulations to require the State to report certain information relating to air pollution episodes and contingency plan actions. This information is required by an August 7, 1977, amendment to section 313 of the Clean Air Act to be included in EPA's annual report to Congress. A detailed discussion of the information is included under the discussion of the regulations.

Reorganization of Part 51

In an effort to make part 51 more readable and understandable, EPA intends to reorganize and expand the format of the regulations. The restructured regulations will contain as new subparts, information currently organized as sections. This will allow the use of more headings and will enable the reader to more readily find appropriate requirements. Subsequent to these proposed revisions other sections of part 51 will be rewritten and reorganized utilizing a similar format.

Discussion of Revisions—Part 51

The regulatory revisions to part 51 being proposed today revoke §§ 51.7, 51.17, and 51.17a; revise § 51.16; amend § 51.24; and establish Subpart J—Air Quality Monitoring, Subpart O—Miscellaneous Plan Content Requirements, and Subpart Q—Reports. The revisions to §§ 1.3, 51.6, 51.13, and 51.15 are described below in a section of this preamble devoted to a discussion of parts 51, 52, 53, and 60. All of the revisions discussed in that section of this preamble are related and, accordingly, are discussed collectively.

Section 51.16 Prevention of air pollution emergency episodes.

The use of tape samplers or other particulate monitors are desirable for use during air pollution episodes and for purposes of daily reporting of an index of air quality because they provide more frequent data at shorter time intervals.

Since the original promulgation of § 51.16 and appendix L, the latter of which suggests episode pollutant levels and describes example controls for those episode levels, it has become apparent that there is no universally consistent relationship between meaurements on the high-volume sampler (hi-vol) and the tape sampler. The discrepancy exists because the tape sampler measures light transmittance of collected particulate matter, which is affected by particle size and color, whereas the hi-vol measures mass. The values for light transmittance, expressed as COH's, in § 51.16 and appendix L, therefore, are not necessarily equivalent to the values given in micrograms per cubic meter ($\mu g/m^3$) which are the units of measurement for the hi-vol. The references to coefficients of haze (COH's) therefore, would be removed from § 51.16 as well as appendix L.

A guideline is currently under development which explains the procedure for establishing a site-specific relationship between the hi-vol and other particulate monitors. After such a relationship is established at a specific site, data from the particulate monitor can be directly converted to $\mu g/m^3$ to obtain a value that would correspond to a hi-vol measurement. If such a particulate monitor were determined to be adequate to measure particulate, it would be allowed for use at the specific site instead of a hi-vol; but only for purposes of air pollution episode monitoring and daily air pollution index reporting.

Monitoring for purposes of air pollution episodes and an air quality index is discussed in further detail below.

Section 51.24 Prevention of significant deterioration of air quality.

Paragraph (n)(3) would be added to § 51.24 to require that the plan contain provisions that the quality assurance requirements of appendix B to part 58 be followed by an owner or operator of a source required to monitor for purposes of prevention of significant deterioration. A similar requirement would be added to § 52.21.

Subpart J—Ambient Air Quality Surveillance

This subpart would replace § 51.17 which currently contains the requirements for a monitoring network. It would contain one section, § 51.190, as discussed below.

Section 51.190 Ambient air quality surveillance: Plan content.

This section would require the State to meet the requirements in part 58 pertaining to the ambient air quality monitoring network for purposes of the SIP. As previously discussed, part 58 would contain the monitoring requirements and criteria for the SIP as well as other ambient air quality monitoring. Paragraph (a) of this section would specify that the plan meet the plan content requirements of part 58 whereas paragraph (b) would require the State to meet other requirements of part 58 applicable to the State such as network design, continuation of station operation, and system modification.

Subpart O—Miscellaneous Plan Content Requirements

This subpart would be established to contain requirements unrelated to material in other subparts. Upon promulgation it would include only § 51.285, however, at a later date, other sections would be added to this subpart.

Section 51.285 Public notification.

The provisions of this section would satisfy section 127 of the Clean Air Act which was added to the act on August 7, 1977. The provisions would reflect the section 127 requirements that the public be informed of NAAQS violations, health hazards associated with violations, pollution control measures, and ways in which the public can participate in rulemaking. The minimum requirements the State must meet would be to prepare and distribute an annual report containing such information. By January 1, 1980, the State would have to submit a SIP revision providing for the annual report. A guideline on this subject also is under development. The guideline will explain additional ways in which the State may meet the requirements of section 127. EPA solicits comments on this approach to implementing section 127.

Subpart Q—Reports

This subpart would replace § 51.7 which currently contains reporting requirements for air quality data, emissions data, and actions by the State related to the SIP. Only the air quality reporting requirements of § 51.7 would be substantively revised and be trans-

ferred to the new part 58. The emissions data reporting requirements would be slightly revised and would appear as sections in the new subpart Q. The requirements for reporting State actions would remain largely unchanged and would also comprise several sections in subpart Q. The sections in this subpart are as follows:

Section 51.320 Annual air quality data report.

This section would require the State to meet the air quality reporting requirements of part 58 which are necessary for SIP purposes.

Section 51.321 Annual source emissions and State action report.

The semiannual source emissions and State actions report now described by § 51.7 would be changed to an annual report by this section. The State would have 6 months after the end of the calendar year in which to submit the report which would contain that calendar year's information. Requiring only one report annually and increasing the time period for submission from 45 days to 6 months is intended to reduce the reporting requirements on the States.

Section 51.322 Sources subject to emissions reporting.

This section would define which sources, and which emission points within those sources, are subject to emissions reporting. These requirements are somewhat different from those now existing in § 51.7. The minimum size facility for which CO emissions would be reported would be revised from 100 tons per year (TPY) to 1,000 TPY and the points within the facility from 25 TPY to 250 TPY. This more closely reflects the size of CO emitting facilities that potentially threaten the standards for CO.

The minimum size for lead-emitting facilities and also the emission points within the facilities would both be defined as 5 TPY. The facility size would not be defined any higher than the emission point size (5 TPY), as is done for other pollutants, to insure that all emission points greater than 5 TPY were reported regardless of facility size.

Section 51.323 Reportable emissions data and information.

This section would define the information that must be reported for the emission points defined in § 51.322. The States would be referred to the AEROS Users Manual for a description of the required data. This procedure would eliminate the necessity for repeating the lengthy information contained in the Aerometric and Emissions Reporting System (AEROS) Users Manual.

This section would also further define which emission points would be subject to submission of emissions information. This portion of § 51.323 is identical in substance to § 51.7(b)(3) with the exception that States would be required to update the year of record of data for facilities whose emissions have not changed. This requirement is in response to the fact that in some cases States fail to submit information for certain sources for which emissions have not changed. Users of the emissions data cannot be sure that the data are accurate in such an instance because the year of record will not be current. The State, if so desired, may meet this requirement by resubmitting the data as if it were new data.

Section 51.324 Progress in plan enforcement.

This section is a reorganization of § 51.7(b)(4) (i) and (ii). The reorganization and the addition of the word "point" in front of "source" were done for clarity. Paragraph (b)(4)(iii), which requires reporting the percent of sources in compliance, would be deleted in order to reduce reporting requirements.

Section 51.325 Contingency plan actions.

This section would be added in order to obtain certain information from the State so that the information could be included in EPA's annual report to Congress. Such information is required by an August 7, 1977, amendment to section 313 of the Clean Air Act. The information would consist of a summary and evaluation of contingency plan actions taken during the year and an account and explanation of any air pollution episode during which no contingency plan actions were taken.

Section 51.326 Reportable revisions.

This section is identical in substance to § 51.7(b)(5).

Section 51.327 Enforcement orders and other State actions.

This section is identical in substance to § 51.7(d).

Section 51.328 Plan prescribed actions.

This section is identical in substance to § 51.7(e) with the exception of changing "semi-annual report" to "annual report."

APPENDIX L—EXAMPLE REGULATIONS FOR PREVENTION OF AIR POLLUTION EMERGENCY EPISODES

The reference to COH's would be deleted from this appendix. This action is discussed above under § 51.16.

DISCUSSION OF REVISIONS—PARTS 51, 52, 53, 60

Parts 51, 52, 53, and 60 contain numerous references to §§ 51.7, 51.17, and 51.17a. Since these sections would be revoked and replaced in these proposed regulations by new subparts in part 51 or by portions of the new part 58, the references to the three revoked sections would be inaccurate. This action being proposed today would revise the references to the three revoked sections to refer to the appropriate sections in the revised part 51 or the new part 58. With several exceptions which are discussed below, the substance of the amended portions of parts 51, 52, 53, and 60 would remain unchanged.

Section 51.13 Control strategy, sulfur oxides and particulate matter.

The second sentence of paragraph (g) contains a reference to § 51.17 and a provision for using the continuous conductimetric method for measuring sulfur dioxide. The reference to § 51.17 would be replaced with a reference to appendix C of part 58. Provisions for using the continuous conductimetric method have previously been included in part 53 regulations, therefore, the provision for this method in § 51.13(g) is unnecessary and would be eliminated.

Section 51.15 Compliance schedules.

Paragraph (a)(2) of this section was designed to apply to the original submission of the SIP's. Recent EPA guidance supersedes these compliance schedule submission requirements in § 51.15(a)(2). Rather than correct the references to § 51.7 which are in paragraph (a)(2), the entire paragraph (a)(2) would be revoked since it is out of date.

Sections 52.779, 52.2029, and 52.2482 contain disapprovals of the Indiana, Pennsylvania, and Washington SIP's respectively since they did not meet the provisions of § 51.17. Since § 51.17 would be revoked and new SIP provisions would be required by part 58, it would be of no significance that the SIP, prior to submission by the State of the new SIP provisions, was disapproved. Accordingly, rather than correcting the references to § 51.17 in these three sections, the entire sections would be revoked.

Section 52.1175 Compliance schedules.

On May 31, 1972, the Michigan SIP was disapproved insofar as it did not provide for submission of compliance schedules in time for inclusion in the first semi-annual report required by § 51.7. This requirement appears in § 51.15(a)(2); however, as discussed above, paragraph (a)(2) would be removed from § 51.15. Also, § 51.7 would

be revoked and the semi-annual report would become an annual report. Section 52.1175 would be revised to indicate that the SIP was disapproved as not meeting the § 51.15 requirements as of May 31, 1972. This approach would preserve the dsapproval of the Michigan SIP even though those original requirements would be changed. The preservation of the disapproval would be necessary as a legal basis for any promulgation of compliance schedules.

DISCUSSION OF REVISIONS—PART 58

Section 319 of the Clean Air Act Amendments of 1977 requires that EPA promulgate regulations establishing a national air quality monitoring system which uses standardized measurement and reporting procedures, and provides for daily reporting of air quality based upon a uniform air quality index. The national network must not duplicate any monitoring being carried out by States required under any applicable implementation plan.

Further, section 319 specifically requires that any air quality monitoring required under section 110 must use the standardized measurements and reporting procedures and measure air quality according to the standard index developed for the national system.

It is EPA's intent that the regulations being proposed today for State implementation plan monitoring also serve as the basis for establishing a national monitoring system. It is EPA's judgment that this approach is in keeping with the intent of section 319, i.e., the States will essentially be made responsible for operation of the national air quality monitoring system and reporting according to a standard index. These regulations also require the use of specific monitoring methodology, quality assurance procedures, uniform instrument or instrument probe siting critieria, certain sampling intervals, and reporting of a standardized air pollution index.

The new part 58 would be established to contain the requirements and criteria for monitoring ambient air quality. The important divisions of this part are the monitoring criteria, the SIP requirements, the requirements pertaining to a national network (the NAMS provisions), the index reporting requirements, and the provisions for monitors operated by the Federal Government.

As stated above, lengthy and detailed material would be put into appendix form. It should be noted that these appendices are being proposed for comment and will be promulgated with the parts 51 and 58 regulations. Both the appendices and the regulations meet the definition of a rule under the Administrative Procedures Act (APA), 5 U.S.C. 551 et seq; therefore, the informal rulemaking procedures of section 553 of the APA are being followed for both. Sections of the appendices contain material that is intended as guidance and is not meant to be mandatory. The requirements in the appendices, in contrasts, are clearly written as such and will be mandatory upon promulgation.

SUBPART A—GENERAL

This first subpart would contain definitions, an explanation of the purpose of part 58, and the applicability of the requirements. Section numbers would be left available for later additions to this subpart.

SUBPART B—MONITORING CRITERIA

As discussed above, criteria have been established to insure quality and timely ambient air quality monitoring data for purposes of satisfying both the SAMWG recommendations and section 319 of the Clean Air Act. These criteria, in general, are lengthy and have been put in the form of appendices A, C, D, and E to part 58. These appendices will be discussed below. Sections 58.10 through 58.12 would require the appendices A, C, D, and E be followed.

Section 58.13 Sampling interval.

The sampling interval criteria would be included in this section. The criteria are similar to existing requirements; continuous sampling for automated instruments and one sample every 6 days for manual methods. The sampling interval criteria for PSD monitoring would be contained in appendix B.

Section 58.14 Special purpose monitors (SPM).

Following the proposed criteria should result in reliable data that can be considered comparable to any data collected under the criteria. If States wish to use data from SPM monitors for SIP purposes, those SPM monitors would have to meet the monitoring criteria established for SLAMS. Only by following that criteria would the data from SPM stations be comparable to SLAMS data and acceptable to EPA. This section reflects such a requirement.

The concept of the SPM stations provides that they would be used to supplement the SLAMS network in order to increase the overall effectiveness of the State's monitoring efforts. Although the SPM stations would likely not be permanent stations, for purposes of comparability, the States would be encouraged to follow the monitoring criteria of part 58 when operating SPM stations. If data were not used for SIP purposes, however, the State could use its discretion in the following the criteria.

SUBPART C—STATE AND LOCAL AIR MONITORING STATIONS (SLAMS)

Section 58.20 Air quality surveillance: Plan content.

This section would require submittal by January 1, 1980, of a SIP revision providing for a SLAMS network. Final completion of the SLAMS network, however, would not be necessary until January 1, 1983, as previously stated. It would be necessary for the SIP revision to delete the existing ambient air monitoring provisions in the SIP in order to avoid conflict with the added provisions for a SLAMS network.

The SIP revision would establish the SLAMS network, would apply the criteria of appendices A, C, D, and E (discussed below) to the monitoring stations, would provide that the surveillance system be reviewed annually, and would provide for monitoring during all stages of air pollution episodes. The annual review would be for purposes of continual assurance that optimum use were being made of monitoring resources. It is anticipated that monitoring stations in the SLAMS network could be added, deleted, or moved as data needs change from year to year.

Requiring the SIP to contain these provisions is based on section 110(a)(2)(C) of the act which requires the SIP to provide for "establishment and operation of appropriate devices, methods, systems, and procedures necessary to: (i) Monitor, compile, and analyze data on ambient air quality and, (ii) upon request, make such data available to the Administrator."

The State would be required by this section to maintain for inspection by the public and the regional office, information on each monitoring station such as the location of the station and the monitoring method being used. Individual station locations would not be part of the SIP and, therefore, modifications to the network could be made without requiring a formal SIP revision. This should encourage the State to make any needed yearly changes to the SLAMS network to make it more responsive to data needs or resource constraints.

The State would also keep available for inspection the statement of monitoring objectives and the spatial scale of representativeness for each station and a schedule for completion of the network. Determining the objective and spatial scale for each station is a step in the process of network design as described in appendix D to part 58. It is frequently necessary to have such information available when examining monitoring data in order to correctly interpret such data.

Section 58.21 SLAMS network design.

The State would be required to consult regional office representatives when designing the SLAMS network. The purpose of this requirement would be to input any experience available in the regional office into the process and also to assure that data needs of the regional office are met. The regional office would also participate in the annual review and system modification process discussed under § 58.25.

Section 58.22 SLAMS methodology.

This section would require that any SLAMS contain acceptable methodology at the time the station were put into operation as a SLAMS. The acceptable methodology would be specified in appendix C. That appendix would include any "grandfather" clauses now contained in § 51.17a.

Section 58.23 Monitoring network completion.

This section would establish January 1, 1983, as the date by which all SLAMS must be located and sited correctly and by which quality assurance procedures should be implemented. States would be given this extended period of time due to possible resource constraints which could make it impossible to complete the network and implement quality assurance procedures in a shorter time frame.

Section 58.24 Interim network.

Upon promulgation of these regulations § 51.17 would be revoked. Part 51 would, therefore, not require the SIP to contain provisions for ambient air quality monitoring until the January 1, 1980, submittal date for the SIP revision required by § 58.20. Section 58.24 requires that States continue to operate existing monitors until submittal of the January 1, 1980, SIP revision containing monitoring provisions.

All monitoring stations now described in the plan would be kept in operation until the SIP revision was submitted. After submission of the SIP revision, only those monitoring stations identified as becoming a SLAMS in the new monitoring network would be kept in operation. This requirement would assure continuation of data collection while freeing those stations which would not become SLAMS as early as possible to be used for other purposes.

Section 58.25 System modification.

As discussed earlier, it is anticipated that States would continually review and modify their monitoring networks on an annual basis. This section requires the State to develop and implement a schedule for system modification if the annual review indicates such a change is warranted. The regional office would be involved in this procedure in order to be kept informed of the monitoring situation and to assure that their data needs are considered during any action to modify the network.

Section 58.26 Annual SLAMS summary report.

The reporting requirements for the SLAMS ambient air quality data would be contained in this section. The data for any calendar year would be summarized, certified by the State program director, and submitted on or before July 1 of the following calendar year. Appendix F to part 58 would specify the information that would be contained in the annual report.

In addition to the SLAMS data summary, certain information pertaining to incidents of pollutant concentrations reaching significant harm levels, as defined in § 51.16, would be reported. This information is required by section 313 of the Clean Air Act to be included in EPA's annual report to Congress as is the information discussed under § 51.325. The location, date, pollutant source, and duration of each incident would be reported.

Section 58.27 Compliance date for air quality data reporting.

The new reporting requirements described above for SLAMS data would take effect for data collected during 1981. Data collected prior to January 1, 1981, would be reported quarterly as is now required by § 51.7. The last quarterly report for 1980 would be submitted in January or February 1981.

Section 58.28 Regional Office SLAMS data acquisition.

Regional office data needs differ from region to region and in general differ from the proposed NADB requirements. Accordingly, this section is intended to allow the regional offices the authority to obtain individual data values or summaries as needed. It is anticipated that regional office personnel and State representatives will cooperatively develop a schedule for periodic submission of those data needed by the regional office. Such agreements may supplement the annual SLAMS data summary report required by § 58.26.

SUBPART D—NATIONAL AIR MONITORING STATIONS (NAMS)

The intent of the previously discussed NAMS network is to address certain requirements of section 319 of the Clean Air Act and also to provide a mechanism for collecting and submitting, in a timely fashion, data upon which to base national assessments of air quality. Appendix D will be used to select the NAMS. All NAMS will be selected from within the overall SLAMS network. The SLAMS annual report must include summarized statistics from the NAMS as well as from all other SLAMS. Individual data values or summaries from all or any part of the SLAMS may be considered at the national level.

Section 58.30 NAMS network establishment.

This section would require that a description of the NAMS network be submitted by January 1, 1980. This description would not be part of the SIP even though the submittal date coincides with the submittal deadline for the SLAMS SIP revision required by § 58.20. Since the NAMS would consist of certain selected SLAMS, the process of determining the locations for the NAMS would have to be a part of the exercise of designing the SLAMS network. This section would also contain the requirement that the network design procedure in appendix D for NAMS be followed during the SLAMS network design process.

Section 58.31 NAMS network description.

Certain information including station location, methodology, and monitoring objective would be needed at the national level for accurate interpretation of the NAMS data. This section would describe that information which would be included in the network description required by § 58.30. Also, a schedule for completing the NAMS would be required in order to determine the approvability of the network.

Section 58.32 NAMS approval.

The regional offices could use the data submitted through the NAMS reporting process, however, the regional office, through § 58.28, would have its own mechanism for obtaining air quality data. The offices of EPA at the national level, however, would be primarily concerned with the NAMS network design and completion since the NAMS data would be used for trends, certain special studies, and possibly national policy. Approval of the NAMS would, therefore, be at this level for purposes of assuring that national data needs were met.

Section 58.33 NAMS methodology.

As discussed below, a portion of appendix C would contain the methodology requirements for the NAMS. This section would require that all NAMS in existence at the time of network description submittal use the specified methodology. For stations established at some later date, the specified methodology would be required upon establishment of the station.

Section 58.34 NAMS network completion.

Those SLAMS designated as NAMS would in general be those stations considered to be located in the most important areas, i.e., areas of the highest pollution, areas with a combination of high pollution and high population exposure, etc. Since these NAMS would be the more important stations in the SLAMS network, they would be required to be in operation sooner than the remaining stations in the SLAMS network. January 1, 1981, would be the date by which all the NAMS would be required to be in operation and meeting all the requirements for NAMS.

Section 58.35 NAMS data submittal.

This section would establish the quarterly reporting requirements for NAMS data. The specific information to be submitted would be those data described in the AEROS users manual as necessary for completing the storage and retrieval of aerometric data (SAROAD) air quality data forms. The data would also be required to be validated according to procedures described in the AEROS users manual.

The validated data would be required to be submitted to NADB within 90 days of the end of the calendar quarter. The procedures for submittal of the NAMS data would be developed between the State and the appropriate regional office. For instance, the State may need to submit the data at the end of 45 days in order to allow another 45 days for regional office review, return to the State for any corrections, and submittal to the NADB.

This section would also indicate that the data from stations designated as NAMS are also SLAMS data and are still subject to inclusion in the SLAMS annual summary report.

SUBPART E—AIR QUALITY INDEX REPORTING

Section 58.40 Index reporting.

This section would establish the requirement for certain large urban areas to report daily an index of air quality. The index and the section 319, Clean Air Act, requirement for such reporting will be discussed in detail under appendix G.

Due to resource constraints on State and local agencies, a phased approach is being proposed for implementing these index reporting requirements. Areas over 500,000 population would begin reporting January 1, 1981, since it has been determined that many of these areas are presently reporting an air quality index. Areas over 200,000 population would begin reporting 2 years later.

The population of urban areas for purposes of these requirements would be determined from a 1976 supplement to the 1970 U.S. census. At a later date an updated census could be used if it was determined that the additional areas should be included.

As provided in appendix G, data used for PSI purposes could be "real time" data that is not validated. Also, the PSI in some cases might be a projected value based on expected weather patterns and other such factors. In light of the reliability and nature of PSI based data, historical PSI values should not be used for air quality evaluation or for intercity comparisons. The nature of the data would be sufficient for informing the public of daily air quality; however, the data would not be acceptable for other purposes.

SUBPART F—FEDERAL MONITORING

Section 58.50 Federal monitoring.

This section would establish the prerogative of EPA to operate ambient air monitors in instances where the State failed to locate and operate a monitor. The circumstances under which this might occur are:

(a) Where a State failed to locate a SLAMS in an area where the regional office felt a monitor should be located in order to meet the monitoring network objectives described in appendix D, or

(b) Where a State failed to locate a NAMS in an area from which data were needed in order to meet EPA national data needs.

Failure to locate, or schedule to be located, a monitoring station during either the initial network design process or during any annual review of the network could precipitate location of a Federal monitoring station. Regional office personnel would participate in the initial network design process and thereby express their data needs and their interpretation of the appendix D monitoring objectives. EPA personnel have already visited States and regional offices and selected certain monitoring stations from the existing monitoring networks as candidates for NAMS. The States, therefore, would be aware of EPA data needs and criteria for approval of any network modifications resulting from the annual review process.

Section 58.51 Monitoring other pollutants.

This section establishes the fact that, for pollutants for which NAAQS do not exist, this agency may wish to establish uniform criteria and methodology whenever the Administrator determines that a nationwide, urban-oriented, monitoring program is necessary. Such criteria would pertain to quality assurance, instrument operation and siting, monitoring methods, and other aspects of monitoring that may be necessary to insure accurate and comparable data throughout the United States. EPA would strongly encourage that any other governmental agency proposing to establish such a nationwide, urban-oriented, monitoring system, develop uniform criteria for review by the EPA Administrator prior to implementing such a monitoring program.

APPENDIX A—QUALITY ASSURANCE REQUIREMENTS FOR STATE AND LOCAL AIR MONITORING STATIONS (SLAMS)

The findings and recommendations of SAMWG published in the previously discussed strategy document emphasized the importance of a quality assurance program in producing timely data that are complete, precise, accurate, and comparable. The findings of SAMWG indicated deficiencies in quality control as well as unknown precision and accuracy of the data being reported. In response to these findings and recommendations, the quality assurance program in appendix A was developed to remedy these problems.

The proposed quality assurance program, although resource intensive, is considered by EPA to be essential in order to reach the goal of producing timely data of the required precision, accuracy, completeness, and comparability. The quality assurance procedures would be required during the operation of the SLAMS network. It would also be necessary to follow the procedures, as required by § 58.14, when operating SPM stations for the purpose of collecting data to be used in support of SIP revisions or in developing control strategies.

The major items which would be required to be in a State SLAMS program are:

(a) Activities to demonstrate within control conditions. This consists of the actual operation procedures.

(b) Activities to assess agency precision and accuracy. This consists of data validation procedures.

(c) Participation in EPA's national quality assurance program. This section is concerned with performance and system audits.

(d) Calculations and reporting of precision and accuracy. This section deals with data handling.

The details of these areas are contained in appendix A.

APPENDIX B—QUALITY ASSURANCE REQUIREMENTS FOR PREVENTION OF SIGNIFICANT DETERIORATION (PSD) AIR MONITORING

This appendix contains the quality assurance requirements to be applied to monitoring stations operated for purposes of gathering data for prevention of significant deterioration actions. The requirements are similar to those contained in appendix A, however, there are enough differences to

warrant a separate appendix. These quality assurance requirements are necessary in order that data from PSD stations be comparable to the data from the SLAMS network.

APPENDIX C—AMBIENT AIR QUALITY MONITORING METHODOLOGY

The quality and comparability of ambient air quality data bears a direct relationship to the quality and comparability of the monitoring methods used to collect such data. One step in assuring data quality, therefore, is to assure the use of prescribed methodology.

The requirments in appendix C have been developed for the purpose of limiting allowable monitoring methodology to those methods which have been tested and proven reliable or to those for which reliability can be demonstrated.

The proposed appendix C would replace the methodology stipulations in the existing § 51.17 and § 51.17a and would also incorporate the nonconforming analyzer exceptions and the replacement dates for analyzers now in § 51.17a. Any monitoring station in the SLAMS network would have to meet these requirements.

There would be an additional requirement on those SLAMS which were also to be designated as NAMS. For those stations the requirements would specify that SO_2, NO_2, CO, and O_3 be measured by continuous analyzers. This requirement is intended to assure accurate and consistent data for assessment of national air quality trends and policy decisions.

The exceptions allowing the use of nonconforming analyzers appearing in the proposed appendix C are identical in substance to those in the existing § 51.17a. Essentially, these exceptions allow the use of certain monitors which do not conform to the reference or equivalent method specifications if it can be demonstrated that acceptable data will be generated for the circumstances under which the methods would be used.

Table B-1 of 40 CFR part 53 contains the concentration range requirements for reference or equivalent methods. These ranges do not extend high enough to include the significant harm levels described in § 51.16, nor do they include all the suggested air pollution eposode level concentrations in appendix L to 40 CFR part 51. The States are required by § 58.20(c) to provide from monitoring during air pollution episodes; however, by definition, reference or equivalent methods cannot be used at the higher concentrations. Section 4.0 of appendix C, therefore, allows the use in SLAMS of undesignated ranges on those analyzers which are designated reference or equivalent methods on ranges conforming to table B-1. These ranges may be used in any SLAMS but only when ambient levels require their use. For those SLAMS designated as episode stations, such a reference or equivalent method with a higher range would have to be used.

For any SLAMS designated as an episode monitoring station for particulate matter, measurement with a high-volume sampler every 6 days will not be sufficient to cover an episode. Appendix C, therefore, requires a method be used which has the capability of short-term measurements in the episode concentration ranges and for which a quantitative correlation can be established with the reference method for particulate matter. The guideline under development which describes the correlation process was discussed under § 51.16.

APPENDIX D—NETWORK DESIGN FOR STATE AND LOCAL AIR MONITORING STATIONS AND NATIONAL AIR MONITORING STATIONS (NAMS)

The operation of ambient air quality monitoring stations and collection of data, even though data are of adequate quality, is not in itself enough to sufficiently assess the air quality situation of an area. Some consideration must be given to the geographic location of monitoring stations in order to obtain data that are representative of the area, that are not unduly influenced by point sources, and that satisfy all the data needs of the agency for that area.

In some instances, data needs dictate geographical location parameters. In other instances, data interpretation requires specific consideration of station location in order to avoid misinterpretation of the data. In light of the importance of geographic location, appendix D is proposed in order to establish a uniform approach in the design of monitoring networks.

Appendix D would relate procedures for locating monitoring stations to monitoring objectives. The process of network development would be a joint effort between the State and regional office. The first step would be to determine the data needs of both so that the network can be designed accordingly. The number of stations would depend on data needs and other factors specific to an area.

An important step in the network design process would be to assure that an adequate number of NAMS are designated or established and that they are located appropriately. As previously explained, the NAMS, as a rule, would be selected from the stations that were located in the areas considered to be most critical or most representative of the areas of highest pollutant concentrations. Since the NAMS network in any State is part of an overall national air monitoring network, criteria are included in appendix D for determining the number and location for the NAMS.

APPENDIX E—PROBE SITING CRITERIA FOR AMBIENT AIR QUALITY MONITORING

After the process of network design is completed, stations have to be physically located. The most important considerations during siting of stations are to prevent interference from local objects, to keep monitors out of the reach of vandals, and to site the monitor or monitor probe so as to produce a sample representative of the breathing zone. Appendix E would consists of siting parameters which would specify minimum distances from roadways, buildings, trees, chimneys, and other obstructions in order to avoid interference from these objects. Vertical and horizontal distances would also be specified so that sampling can be conducted in the breathing zone while preventing vandalism.

APPENDIX F—STATE AND LOCAL AIR MONITORING STATIONS (SLAMS) AIR QUALITY ANNUAL REPORT

This appendix describes the information which would be required by § 58.26 to be submitted in the State's annual SLAMS summary report. Such information would be stored in the NABD data files and would be used at the national level to evaluate the overall effectiveness of States in achieving national ambient air quality standards and to augment the more detailed analysis performed on individual data values submitted from the NAMS.

APPENDIX G—UNIFORM AIR QUALITY INDEX AND DAILY REPORTING

As described above, the Clean Air Act (CAA) requires that regulations be promulgated establishing an air quality monitoring system throughout the United States which measures air quality according to a uniform air quality index and provides for daily analysis and reporting of air quality based on such uniform air quality index. The uniform air quality index being proposed today to fulfill these requirements is a modified form of the pollutant standards index (PSI). This appendix would describe the PSI and demonstrate the procedures and calculations required in order to obtain the index value and procedures for reporting the index. Detailed background and references are provided in order that the reader understand the basis for the PSI and the justification for requiring it. The PSI was developed and later published as guidance for use by State and local agencies on a voluntary basis. Prior to today's proposal, comments from State and local agencies were solicited regarding the possible use of PSI in meeting the re-

quirements of the CAA. These comments proved to be of great value in shaping appendix G.

Numerous agencies were concerned that mandated use of PSI would require additional ambient monitoring beyond that which would be provided by the SLAMS network. For example, most agencies point out that mandated daily reporting of TSP would greatly strain their capabilities since TSP sampling is ordinarily done at a frequency of once every 6 days. EPA believes that sampling for TSP every 6 days is sufficient for purposes of index reporting. Also, agencies normally increase the frequency of particulate measurements during episode conditions. These more frequent data could be integrated into the index computational structure.

A number of agencies asked for an exemption from the index reporting requirements in situations where an area has air quality consistently better than the standards for a pollutant. EPA agrees such an exemption is justified and provides for exemption in the proposed regulations for such cases. Similarly, the proposed appendix would not require index reporting on more than 5 days per week, thus allowing agencies the flexibility to not report the index during weekends when monitoring data and analysis capabilities are not normally available. Agencies would be urged to forecast the index for weekends in such situations.

Questions have been raised regarding the rigidity of the PSI structure and its descriptor words, health effects, and cautionary statements. EPA has considered these comments in light of the CAA which requires a uniform air quality index, and concludes that: (1) The breakpoints relating concentrations and index units must not vary among reporting agencies. To allow local variations (e.g., breakpoints based on local air quality standards and episode criteria) would be contrary to the terms of section 319 and would perpetuate public confusion about air quality. (2) Health descriptor words associated with the index should not vary among reporting agencies. This is necessary to insure that air quality described as unhealthy in one area is consistent with air quality similarly described in another area. To allow locally different descriptor words for identical PSI numerical values would not meet the criteria of a uniform index. Exceptions could be granted to agencies for reporting numerical values at or below 100 ("moderate" or "good"). For example, some agencies argue that background values of ozone are typically above 0.04 ppm almost every day which would effectively preclude them from announcing air quality as "good." Accordingly, EPA solicits additional comments on the issue of allowing agencies to describe air quality below PSI values of 100, as "good." (3) Both generalized health effects and cautionary statements should not be mandated for daily reporting but left to the discretion of the reporting agency. A number of commenters argued that these kinds of statements are more related to local actions to abate air pollution and its potential consequences and should not be part of federally mandated daily reporting system. Further, they argue that these generalized effects are not entirely supported by scientific evidence and thus not reasonable to mandate nationally. EPA understands the reservations regarding cautionary statements. The requirement for these statements, therefore, has been removed.

Two other issues were raised by commentors which warrant discussion. The first deals with the nature and responsibility for public reporting. Many reviewers were uncertain as to who would be responsible for insuring that prominent public notice be given on a daily basis. They point out that a daily index report could be rejected by local news media as being unworthy for public notice. In practice, this has not proven to be a problem since a number of State and local agencies have made satisfactory arrangements for television or newpaper coverage. Nevertheless, EPA solicits comments on: (1) How to effectively overcome the potential reluctance of news media in reporting daily air quality conditions, and (2) the most appropriate form of the regulation for accomplishing this.

The second, but related issue is that of timeless of the daily index report. Several agencies commented that reporting air quality conditions for a previous 24-hour period was of no practical use to the general public. They argue that the most meaningful way to make use of the index is to either report "current" conditions, or alternatively, forecast the air quality index. For example, the South Coast Air Quality Management District in California issues a quantitative forecast of PSD for each of several geographic subregions in the basin. The forecast is issued at 10 a.m. each day and applies to "worst" air quality conditions which are expected to occur during the reporting day.

Although some agencies do not have extensive air quality forecasting experience, the mechanism is available for cooperation among air pollution control agencies and State and local weather forecasting services. EPA solicits comments as to the adequacy of existing air quality forecasting technology and the feasibility of implementing a requirement that the uniform air quality index be forecast daily.

Impact Statements

In accordance with section 3 of Executive Order 12044 (43 FR 12661), these regulations have been determined not to present major economic consequences for the general economy, individual industries, geographical regions, or any levels of government. Accordingly, a regulatory analysis as defined in Executive Order 12044 has not been prepared. Similarly, no economic impact statement was deemed appropriate under Executive Orders 11821 or 11949.

Comments

All interested persons are invited to submit written comments on the proposed regulations set forth below and the associated appendixes. Comments received by EPA will be available for inspection during normal business hours at the Public Information Reference Unit, 401 M Street SW., Washington, D.C. 20460. The regulations proposed herein, with appropriate modifications will be effective on promulgation in the Federal Register.

Dated: July 7, 1978.

Douglas Costle,
Administrator.

PART 51—REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS

EPA proposes to amend Part 51 of Title 40, Code of Federal Regulations, as follows:

1. The table of contents to this part is amended by adding, in the appropriate places, the following:

* * * * *

Subpart J—Ambient Air Quality Surveillance

Sec.
51.190 Ambient air quality surveillance: Plan content.

* * * * *

Subpart O—Miscellaneous Plan Content Requirements

51.285 Public notification.

* * * * *

Subpart Q—Reports

Air Quality Data Reporting

51.320 Annual air quality data report.

Source Emissions and State Action Reporting

51.321 Annual source emissions and State action report.
51.322 Sources subject to emissions reporting.
51.323 Reportable emissions data and information.
51.324 Progress in plan enforcement.

51.325 Contingency plan actions.
51.326 Reportable revisions.
51.327 Enforcement orders and other State actions.
51.328 Plan prescribed actions.

* * * * *

2. Section 51.3 is amended by revising the second sentence in paragraph (c) to remove the reference to § 51.17. As amended, § 51.3 reads as follows:

§ 51.3 Classification of regions.

* * * * *

(c) * * * The requirements applicable to priority IA regions shall be the same as those for other priority I regions, except that the requirements applicable to priority II regions under § 51.16 shall apply. * * *

3. Section 51.6 is amended by revising paragraph (e) to remove the reference to the § 51.7 semiannual report and adding a reference to the annual report required by § 51.321. As amended, § 51.6 reads as follows:

§ 51.6 Revisions.

* * * * *

(e) Revisions other than those covered by paragraphs (a) and (d) of this section must be identified and described in the next annual report required by § 51.321.

* * * * *

§§ 51.7 and 51.17 [Reserved]

4. Sections 51.7 and 51.17 are revoked and reserved.

5. Section 51.13 is amended by revising the second sentence of paragraph (g) to read as follows:

§ 51.13 Control strategy: Sulfur oxides and particulate matter.

* * * * *

(g) * * * Actual measurements must be used where available if based on use of the measurement methods specified in appendix C to part 58 of this chapter. * * *

* * * * *

§ 51.15 [Amended]

6. Section 51.15 is amended by revoking paragraph (a)(2).

7. Section 51.16 is amended by removing the two references to "COHs" in paragraph (a). As amended, § 51.16 reads as follows:

§ 51.16 Prevention of air pollution emergency episodes.

(a) * * *

Particulate matter—1,000 micrograms/cubic meter.	Sulfur dioxide and particulate matter combined—product of sulfur dioxide in micrograms/cubic meter, 24-hour average, and particulate matter in micrograms/cubic meter, 24-hour average, equal to 490×10^3.

* * * * *

§ 51.17a [Revoked]

8. Section 51.17a is revoked.

9. Section 51.24 is amended by adding paragraph (n)(3) to read as follows:

§ 51.24 Prevention of significant deterioration of air quality.

* * * * *

(n) * * *

(3) The owner or operator shall meet the requirements of appendix B to part 58 of this chapter during the operation of monitoring stations required under paragraph (n)(1) of this section.

10. Subpart J is added to read as follows:

Subpart J—Ambient Air Quality Surveillance.

§ 51.190 Ambient air quality surveillance: Plan content.

(a) The plan must meet the applicable requirements of subpart C of part 58 of this chapter pertaining to the establishment of an air quality surveillance system.

(b) In addition to implementing paragraph (a) of this section, the State shall also meet the applicable requirements of part 58 of this chapter pertaining to actions the State must take.

11. Subpart O—Miscellaneous Plan Content Requirements

§ 51.285 Public notification.

By January 1, 1980, the State shall submit a plan revision that contains provisions for:

(a) Notifying the public on a regular basis of instances or areas in which any primary standard was exceeded during any portion of the preceding calendar year,

(b) Advising the public of the health hazards associated with such an exceedance of a primary standard, and

(c) Increasing public awareness of:

(1) Measures which can be taken to prevent a primary standard from being exceeded, and

(2) Ways in which the public can participate in regulatory and other efforts to improve air quality.

12. Subpart Q is added to read as follows:

Subpart Q—Reports

AIR QUALITY DATA REPORTING

§ 51.320 Annual air quality data report.

The State shall meet the requirements of subpart C of part 58 of this chapter pertaining to the annual SLAMS data report.

SOURCE EMISSIONS AND STATE ACTION REPORTING

§ 51.321 Annual source emissions and State action report.

On an annual (calendar year) basis beginning with calendar year 1979, the State agency shall report to the Administrator (through the appropriate regional office) information as specified in §§ 51.323 through 51.326. Reports must be submitted by July 1 of each year for data collected and actions which took place during the period January 1 to December 31 of the previous year.

§ 51.322 Sources subject to emissions reporting.

(a) Point sources subject to the annual emission reporting requirements of § 51.321 are defined as follows:

(1) For particulate matter, sulfur dioxide, hydrocarbons, and nitrogen dioxide, any facility that actually emits a total of 90.7 metric tons (100 tons) per year or more of any one pollutant.

(2) For carbon monoxide, any facility that actually emits a total of 907 metric tons (1,000 tons) per year or more.

(3) For lead or lead compounds measured as elemental lead, any facility that actually emits a total of 4.5 metric tons (5 tons) per year or more.

(b) Annual emissions reporting requirements apply only to emissions of each pollutant from any individual emission point within the facility that emits:

(1) For particulate matter, sulfur dioxide, hydrocarbons, and nitrogen dioxide, 22.7 metric tons (25 tons) per year or more.

(2) For carbon monoxide, 227 metric tons (250 tons) per year or more.

(3) For lead or lead compounds measured as elemental lead, 4.5 metric tons (5 tons) per year or more.

§ 51.323 Reportable emission data and information.

(a) The State shall submit in the annual report the following emissions data and information:

(1) Emissions of particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, and hydrocarbons as specified by AEROS Users Manual, vol. II (EPA 450/2-76-029, OAQPS No. 1.2-039) to be coded into the National

Emission Data System (NEDS) point source coding forms, and

(2) Emissions of lead or lead compounds measured as elemental lead as specified by AEROS Users Manual, vol. II (EPA 450/2-76-029, OAQPS No. 1.2-039) to be coded into the Hazardous and Trace Emissions System (HATREMS) point source coding forms.

(b) Such emissions data and information specified in paragraph (a) of this section must be submitted on either paper forms, punched cards, or magnetic tape in the format of the NEDS point source coding forms or the HATREMS point source coding forms as appropriate.

(c) The emissions data and information specified by paragraph (a) of this section must be submitted in the annual report for any point source for which one of the following conditions occurs:

(1) A source achieves compliance at any time within the reporting period with any regulation of an applicable plan,

(2) A new or modified source receives approval to construct during the reporting period or begins operating during the reporting period,

(3) A source ceases operations during the reporting period, or

(4) A source's emissions have changed since the previous reporting period but the source is not covered by paragraphs (b) (1), (2), or (3) of this section.

(d) If, as determined by the State and the Regional Administrator, the emissions from any point source have not changed since the previous reporting period, the State shall update the year of record of the previously reported data and information specified by paragraph (a) of this section and submit the updated coding forms in the annual report.

§ 51.324 Progress in plan enforcement.

(a) For each point source, the State shall report any achievement made during the reporting period of any increment of progress of compliance schedules required by:

(1) The applicable plan, or

(2) Any enforcement order or other State action required to be submitted pursuant to § 51.327.

(b) For each point source, the State shall report any enforcement action taken during the reporting period and not submitted under § 51.327 which results in civil or criminal penalties.

§ 51.325 Contingency plan actions.

The State shall report any measures taken during the reporting period, and an evaluation of their effectiveness, such as those actions specified in the contingency plan required by § 51.16, to stop emissions of air pollutants causing or contributing to any incident of air pollution which corresponds to a stage of episode criteria as established in the contingency plan. The State shall also report an account of any episode stage, as established in the contingency plan, during which no action was taken by the State or local air pollution control agency and an explanation for the failure to take such action.

§ 51.326 Reportable revisions.

The State shall identify and describe all substantive plan revisions during the reporting period of the applicable plan other than revisions to rules and regulations or compliance schedules submitted in accordance with § 51.6(d). Substantive revisions shall include but are not limited to changes in stack-test procedures for determining compliance with applicable regulations, modifications in the projected total manpower needs to carry out the approved plan, and all changes in responsibilities given to local agencies to carry out various portions of the plan.

§ 51.327 Enforcement orders and other State actions.

(a) Any State enforcement order, including any State court order, must be submitted to the Administrator within 60 days of its issuance or adoption by the State.

(b) A State enforcement order or other State action must be submitted as a revision to the applicable implementation plan pursuant to § 51.6 and approved by the Administrator in order to be considered a revision to such plan.

§ 51.328 Plan prescribed actions.

(a) The State shall report on the status and progress of the following actions if the plan prescribed such action:

(1) Obtaining additional resources.

(2) Adopting new laws or regulations.

(3) Conducting studies to provide a basis for further actions directed toward the attainment and maintenance of national standards.

(4) Initiating new programs or expanding existing programs for the attainment and maintenance of national standards.

(b) The State shall make the report required under paragraph (a) of this section with the annual report as described in § 51.321, commencing with the first annual reporting period following submission of the plan provision that prescribes such action and ending with the completion of the action on which the State must report.

(c) The Administrator will identify those matters on which the State must report.

13. Appendix L is amended by removing references to "COHs" in paragraphs 1.1(b), 1.3(c), and 1.1(d). As amended, appendix L reads as follows:

APPENDIX L—EXAMPLE REGULATIONS FOR PREVENTION OF AIR POLLUTION EMERGENCY EPISODES

* * * * *

1.1 Episode criteria. * * *

(b) "Alert": * * *

Particulate—375 μ/m^3, 24-hour average.

SO_2 and particulate combined—product of SO_2 μ/m^3, 24-hour average, and particulate μ/m^3, 24-hour average equal to 65×10^3.

* * * * *

(c) "Warning": * * *

Particulate—625 μ/m^3, 24-hour average.

SO_2 and particulate combined—product of SO_2 μ/m^3, 24-hour average and particulate μ/m^3, 24-hour average equal to 261×10^3.

* * * * *

(d) "Emergency": * * *

Particulate—875 μ/m^3, 24-hour average.

SO_2 and particulate combined—product of SO_2 μ/m^3, 24-hour average, and particulate μ/m^3, 24-hour average equal to 393×10^3.

* * * * *

Subparts F through I, K through N, and P [Reserved]

14. Subparts F through I, K through N, and P are reserved.

PART 52—APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS

EPA proposes to amend part 52 of title 40, Code of Federal Regulations, as follows:

1. Section 52.21 is amended by adding paragraph (n)(3) to read as follows:

§ 52.21 Prevention of significant deterioration of air quality.

* * * * *

(n) * * *

(3) The owner or operator shall meet the requirements of appendix B to part 58, title 40, Code of Federal Regulations, during the operation of monitoring stations required by paragraph (n)(1).

§§ 52.93, 52.140, 52.266, 52.479, 52.734, 52.1077, 52.1155, 52.1593, 52.2053, 52.2298, 52.2343, 52.2427, 52.2477 [Amended]

2. The following sections are amended by removing "§ 51.7" and replacing it with "§ 58.35."

52.93(b), second sentence.
52.93(c), second sentence.
52.140(b), second sentence.
52.140(c), second sentence.
52.266(d), first sentence.
52.479(c)(2), second sentence.
52.479(c)(3), second sentence.

52.734(b), second sentence.
52.734(c), third sentence.
52.1077(c)(2), second sentence.
52.1077(c)(3), second sentence.
52.1155(f), first sentence.
52.1593(d), first sentence.
52.2053(b), second sentence.
52.2053(c), third sentence.
52.2298(c), first sentence.
52.2343(b), second sentence.
52.2343(c), second sentence.
52.2427(d)(2), second sentence.
52.2427(d)(3), second sentence.
52.2477(c)(2), second sentence.
52.2477(c)(3), second sentence.

§§ 52.779, 52.2029, and 52.2482 [Reserved]

3. Sections 52.779, 52.2029, and 52.2482 are revoked and reserved.

4. Section 52.1160 is amended by revising the last sentence in paragraph (1). As amended, § 52.1160 reads as follows:

§ 52.1160 Monitoring reports.

* * * * *

(1) * * * In addition, all air quality data collected at SLAMS will be summarized and submitted as an annual summary report to the Administrator as required by § 58.26 of part 58 of this chapter.

* * * * *

5. Section 52.1175 is amended by revising paragraph (a) to read as follows:

§ 52.1175 Compliance schedules.

(a) The requirements of § 51.15(a)(2) of this chapter as of May 31, 1972 (36 FR 22398) are not met since rule 336.49 of the Michigan Air Pollution Control Commission provides for individual compliance schedules to be submitted to the State agency by January 1, 1974. This would not be in time for submittal to the Environmental Protection Agency with the first semiannual report.

PART 53—AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS

EPA proposes to amend part 53 of title 40, Code of Federal regulations, as follows:

§ 53.16 [Amended]

Section 53.16 is amended by removing the citation "§ 51.17a(a)(4)" from the third sentence of paragraph (e)(1) and from subdivision (iv) of the first sentence in paragraph (e)(2) and replacing the citations with "section 2.3 of appendix C to part 58".

PART 58—AMBIENT AIR QUALITY SURVEILLANCE

EPA proposes to amend Title 40, Code of Federal Regulations by adding a new part 58 to read as follows:

Subpart A—General Provisions

Sec.
58.1 Definitions.
58.2 Purpose.
58.3 Applicability.

Subpart B—Monitoring Criteria

58.10 Quality assurance.
58.11 Monitoring methods.
58.12 Siting of instruments or instrument probes.
58.13 Sampling interval.
58.14 Special purpose monitors.

Subpart C—State and Local Air Monitoring Stations (SLAMS)

58.20 Air quality surveillance: Plan content.
58.21 SLAMS network design.
58.22 SLAMS methodology.
58.23 Monitoring network completion.
58.24 Interim network.
58.25 System modification.
58.26 Annual SLAMS summary report.
58.27 Compliance date for air quality data reporting.
58.28 Regional office SLAMS data acquisition.

Subpart D—National Air Monitoring Stations (NAMS)

58.30 NAMS network establishment.
58.31 NAMS network description.
58.32 NAMS approval.
58.33 NAMS methodology.
58.34 NAMS network completion.
58.35 NAMS data submittal.

Subpart E—Air Quality Index Reporting

58.40 Index reporting.

Subpart F—Federal Monitoring

58.50 Federal Monitoring.
58.51 Monitoring other pollutants.
Appendix A—Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS).
Appendix B—Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring.
Appendix C—Ambient Air Quality Monitoring Methodology.
Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS).
Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring.
Appendix F—State and Local Air Monitoring Stations (SLAMS) Air Quality Annual Report.
Appendix G—Uniform Air Quality Index and Daily Reporting.

AUTHORITY: Sec. 301(a) of the Clean Air Act (42 U.S.C. 7601) unless otherwise noted.

Subpart A—General Provisions

§ 58.1 Definitions.

As used in this part, all terms not defined herein have the meaning given them in the Act:

(a) "NAMS" are national air monitoring stations which are a subset of the SLAMS ambient air quality monitoring network.

(b) "SLAMS" are State and local air monitoring stations which make up the ambient air quality monitoring network which is required by § 58.20 to be provided for in the State's implementation plan. This definition does not imply that the term "SLAMS" includes the physical structure or facility in which the SLAMS monitor is located. Any combination of SLAMS, NAMS, PSD, or SPM monitors may occupy the same facility or structure without affecting the respective definitions of those monitoring stations.

(c) "PSD station" means any station operated for the purpose of establishing the effect on air quality of the emissions from a proposed source for purposes of prevention of significant deterioration as required by § 51.24(n) of part 51 of this chapter.

(d) "SO_2" means sulfur dioxide.

(e) "NO_2" means nitrogen dioxide.

(f) "CO" means carbon monoxide.

(g) "O_3" means ozone.

(h) "Plan" means an implementation plan, approved or promulgated pursuant to section 110 of the Clean Air Act.

(i) "Administrator" means the Administrator of the Environmental Protection Agency (EPA) or his authorized representative.

(j) "Regional Administrator" means the Regional Administrator of 1 of the 10 EPA Regional Offices or his authorized representative.

(k) "Local agency" means any local government agency, other than the State agency, which is charged with the responsibility for carrying out a portion of a plan.

(l) "State agency" means the air pollution control agency primarily responsible for development and implementation of a plan under the Act.

§ 58.2 Purpose.

(a) This part contains criteria and requirements for ambient air quality monitoring and requirements for reporting ambient air quality data and information. The monitoring criteria pertain to the following areas:

(1) Quality assurance procedures for monitor operation and data handling.

(2) Methodology used in monitoring stations.

(3) Sampling interval.

(4) Siting parameters for instrument probes.

(b) The requirements pertaining to provisions for an air quality surveillance system in the State implementation plan are contained in this part.

(c) This part also acts to establish a national ambient air quality monitoring network for the purpose of providing timely air quality data upon which to base national assessments and

policy decisions. This network will be operated by the States and will consist of certain selected stations from the States' SLAMS networks. These selected stations will remain as SLAMS and will continue to meet any applicable requirements on SLAMS. The stations, however, will also be designated as national air monitoring stations (NAMS) and will be subject to additional data reporting and monitoring methodology requirements.

(d) Requirements for daily reporting an index of ambient air quality to insure that the population of major urban areas are informed daily of local air quality conditions are also included in this part.

§ 58.3 Applicability.

This part applies to State air pollution control agencies and any local air pollution control agency to which the State has delegated authority to monitor ambient air quality for purposes of meeting the air quality surveillance system requirements of § 58.20.

Subpart B—Monitoring Criteria

§ 58.10 Quality assurance.

(a) The State shall meet the quality assurance requirements of appendix A to this part during operation of the SLAMS air quality monitoring network.

(b) The plan must provide that the owner or operator of a proposed source meet the quality assurance requirements of appendix B to this part during the operation of any ambient air quality station operated as a PSD station.

§ 58.11 Monitoring methods.

The requirements of appendix C to this part, which specify appropriate an acceptable monitoring methods, must be met by any SLAMS. In addition, any SLAMS also designated as a NAMS must meet the specific applicable requirements of appendix C pertaining to NAMS.

§ 58.12 Siting of instruments or instrument probes.

The requirements of appendix E to this part, which specify siting parameters for monitoring instruments or instrument probes, must be met by any SLAMS.

§ 58.13 Sampling interval.

(a) Ambient air quality data collected at any SLAMS must be collected as follows:

(1) Hourly averages for continuous analyzers, and

(2) At least one 24-hour sample every 6 days for manual methods.

(b) Ambient air quality data collected at any PSD station must be collected at intervals specified in appendix B to this part.

§ 58.14 Special purpose monitors.

Any ambient air quality monitoring station other than a SLAMS from which the State intends to use the data as part of a control strategy demonstration or as support for a plan revision must meet the requirements for SLAMS described in § 58.22 and, after January 1, 1983, meet the requirements for SLAMS described in §§ 58.10, 58.12, and 58.13.

Subpart C—State and Local Air Monitoring Stations (SLAMS)

§ 58.20 Air quality surveillance: Plan content.

By January 1, 1980, the State shall adopt and submit to the Administrator a revision to the plan which will:

(a) Provide for the establishment of an air quality surveillance system that consists of a network of monitoring stations designated as State and local air monitoring stations (SLAMS) which measure ambient concentrations of those pollutants for which standards have been established in part 50 of this chapter.

(b) Provide for meeting the requirements of appendixes A, C, D, and E to this part.

(c) Provide for the operation of at least one SLAMS per pollutant during any stage of an air pollution episode as defined in the contingency plan and identify any SLAMS designated as an air pollution episode monitoring station.

(d) Provide for the review of the air quality surveillance system on an annual basis to determine if the system meets the monitoring objectives defined in appendix D to this part. Such review must identify needed modifications to the network such as termination or relocation of unnecessary stations and/or location of new stations which are necessary.

(e) Provide for having a SLAMS network description, including the following information for each SLAMS, available at the time of plan revision submittal for public inspection and submission to the Administrator upon request:

(1) The SAROAD site identification form.

(2) The sampling and analysis method.

(3) The sampling schedule.

(4) The monitoring objective and spatial scale of representativeness as defined in appendix D of this part.

(5) A schedule for:

(i) Locating and placing into operation each SLAMS which is not located and operating at the time of plan revision submittal,

(ii) Implementing quality assurance procedures of appendix A to this part for each SLAMS for which such procedures are not implemented at the time of plan revision submittal, and

(iii) Resiting each SLAMS which does not meet the requirements of appendix E of this part at the time of plan revision submittal.

§ 58.21 SLAMS network design.

The design criteria for SLAMS contained in appendix D of this part must be used in designing the SLAMS network. The State shall consult with the Regional Administrator during the network design process.

§ 58.22 SLAMS methodology.

Each SLAMS must meet the monitoring methodology requirements of appendix C to this part at the time the station is put into operation as a SLAMS.

§ 58.23 Monitoring network completion.

By January 1, 1983, all stations in the SLAMS ambient air quality monitoring network description must:

(a) Be in operation,

(b) Meet the requirements of appendixes A, D, and E, and

(c)Be located as described on the SAROAD site identification form required by § 58.20(e)(1).

§ 58.24 Interim network.

Prior to submission of the plan revision required by § 58.20, the State shall continue to operate any station which is in the existing air quality surveillance network described in the plan. After submission of such plan revision, the State shall continue to operate any station which will become part of the SLAMS network.

§ 58.25 System modification.

The State shall develop and implement a schedule to modify the ambient air quality monitoring network to eliminate any unnecessary stations or to correct any inadequacies indicated by the result of the annual review required by § 58.20(d). The State shall consult with the Regional Administrator during the development of the schedule to modify the monitoring program. The final schedule and modifications will be subject to the approval of the Regional Administrator. Nothing in this section will preclude the State, with the approval of the Regional Administrator, from making modifications to the SLAMS network for reasons other than those resulting from the annual review.

§ 58.26 Annual SLAMS summary report.

(a) The State shall submit to the Administrator (through the appropriate regional office) an annual summary report of all the ambient air quality

monitoring data from all monitoring stations designated State and local air monitoring stations (SLAMS). The annual report must be submitted by July 1 of each year for data collected from January 1 to December 31 of the previous year.

(b) The annual summary report required by paragraph (a) of this section must contain the information specified in appendix F to this part.

(c) The annual summary report must also include the location, date, pollution source, and duration of each incident of air pollution during which ambient levels of a pollutant reached or exceeded the level specified by § 51.16(a) of this chapter as a level which could cause significant harm to the health of persons.

(d) The State program director shall certify that the annual summary report is accurate to the best of his knowledge.

§ 58.27 Compliance date for air quality data reporting.

The annual air quality data reporting requirements of § 58.26 apply to data collected after December 31, 1980. Data collected before January 1, 1981, must be reported under the reporting procedures in effect before the effective date of subpart C of this part.

§ 58.28 Regional office SLAMS data acquisition.

The State shall submit all or a portion of the SLAMS data to the Regional Administrator upon this request.

Subpart D—National Air Monitoring Stations (NAMS)

§ 58.30 NAMS network establishment.

(a) By January 1, 1980, the State shall:

(1) Establish, through the operation of stations or through a schedule for locating and placing stations into operations, that portion of a national ambient air quality monitoring network which is in that State, and

(2) Submit to the Administrator (through the appropriate regional office) a description of that State's portion of the network.

(b) Hereinafter, the portion of the national network in any State will be referred to as the NAMS network.

(c) The stations in the NAMS network must be stations from the SLAMS network required by § 58.20.

(d) The requirements of appendix D to this part must be met when designing the NAMS network. The process of designing the NAMS network must be part of the process of designing the SLAMS network as explained in appendix D to this part.

§ 58.31 NAMS network description.

The NAMS network description required by § 58.30 must contain the following for all stations, existing or scheduled:

(a) The SAROAD site identification form (to be submitted through SAROAD procedures).

(b) Identity of the urban area represented.

(c) The sampling and analysis method.

(d) The sampling schedule.

(e) The monitoring objective and spacial scale of representativeness as defined in appendix D to this part.

(f) A schedule for:

(1) Locating and placing into operation each NAMS which is not located and operating at the time of network description submittal,

(2) Implementing quality assurance procedures of appendix A to this part for each NAMS for which such procedures are not implemented at the time of network description submittal, and

(3) Resiting each NAMS which does not meet the requirements of appendix E to this part at the time of network description submittal.

§ 58.32 NAMS approval.

The NAMS network description required by § 58.30 is subject to the approval of the Administrator. Such approval will be contingent upon completion of the network description required by § 51.31 and upon conformance to the NAMS design criteria contained in appendix D to this part.

§ 58.33 NAMS methodology.

Each NAMS must meet the monitoring methodology requirements of appendix C to this part applicable to NAMS at the time the station is put into operation as a NAMS.

§ 58.34 NAMS network completion.

By January 1, 1981, all of the stations in the NAMS network description must:

(a) Be in operation,

(b) Be sited in accordance with appendix E of this part,

(c) Be located as described on the SAROAD identification form required by § 58.31(a), and

(d) Meet the quality assurance requirements of appendix A to this part.

§ 58.35 NAMS data submittal.

(a) The requirements of this section apply only to those stations designated as NAMS by the network description required by § 58.30.

(b) The State shall report quarterly to the Administrator (through the appropriate regional office) all ambient air quality data and information specified by AEROS Users Manual (EPA 450/2-76-029, OAQPS No. 1.2-039) to be coded into the SAROAD air quality data forms. Such air quality data and information must be submitted on either paper forms, punched cards, or magnetic tape in the format of the SAROAD air quality data forms.

(c) The quarterly reporting periods are January 1-March 31, April 1-June 30, July 1-September 30, and October 1-December 31. The quarterly report must:

(1) Be submitted within 90 days of the end of each reporting period, and

(2) Contain all data and information gathered during the reporting period.

(d) Air quality data submitted in the quarterly report must have been validated according to the procedures described in AEROS Users Manual (EPA 450/2-76-029, OAQPS No. 1.2-039) so that such data is ready to be entered into the SAROAD data files.

(e) Nothing in this section shall preclude a State from following all of the reporting requirements applicable to SLAMS in § 58.26 for those SLAMS which are also designated as NAMS.

Subpart E—Air Quality Index Reporting

§ 58.40 Index reporting.

(a) The State shall report to the general public on a daily basis through prominent notice an air quality index in accordance with the requirements of appendix G to this part.

(b) Reporting must commence by January 1, 1981, for all urban areas with a population exceeding 500,000, and by January 1, 1983, for all urban areas with a population exceeding 200,000.

(c) The population of urban areas for purposes of PSI reporting are as defined in "1970 Census of Population; Supplementary Report: Population of Urbanized Areas Established Since the 1970 Census, for the United States; 1970," U.S. Bureau of Census, PC(S)-106, U.S. Government Printing Office, Washington, D.C., October 1976.

Subpart F—Federal Monitoring

§ 58.50 Federal monitoring.

The Administrator may locate and operate an ambient air monitoring station if the State fails to locate, or schedule to be located, during the initial network design process or as a result of the annual review required by § 58.20(d):

(a) A SLAMS at a site which is necessary in the judgment of the Regional Administrator to meet the objectives defined in appendix D of this part, or

(b) A NAMS at a site which is necessary in the judgment of the Administrator for meeting EPA national data needs.

§ 58.51 Monitoring other pollutants.

The Administrator may promulgate criteria similar to that referenced in

subpart B of this part for monitoring a pollutant for which a national ambient air quality standard does not exist. The circumstances under which such an action would be taken are whenever the Administrator determines that a nationwide, urban oriented, monitoring program is necessary to monitor such a pollutant.

PART 60—STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

EPA proposes to amend part 60 of Title 40, Code of Federal Regulations, as follows:

Section 60.25, paragraph (e), is amended by changing the reference to a semiannual report required by § 51.7 to an annual report required by § 51.321. As amended, § 60.25 reads as follows:

§ 60.25 Emission inventories, source surveillance, reports.

* * * * *

(e) The State shall submit reports on progress in plan enforcement to the Administrator on an annual (calendar year) basis, commencing with the first full report period after approval of a plan or after promulgation of a plan by the Administrator. Information required under this paragraph must be included in the annual report required by § 51.321 of part 51 of this chapter.

* * * * *

APPENDIX A—QUALITY ASSURANCE REQUIREMENTS FOR STATE AND LOCAL AIR MONITORING STATIONS (SLAMS)

1. Activities to demonstrate within control conditions.
1.1 Automated methods.
1.1.1 Calibration requirements.
1.1.2 Span check requirements.
1.1.3 Episode monitoring requirements.
1.2 Manual sampling methods.
1.2.1 TSP reference method.
1.2.2 SO_2 reference method.
1.2.3 SO_2 equivalent methods.
1.2.4 NO_2 equivalent methods.
2. Assessment of agency precision and accuracy.
2.1 Automated methods.
2.1.1 Precision.
2.1.2 Accuracy.
2.2 Manual sampling methods.
2.2.1 Precision.
2.2.2 Accuracy.
3. Participation in EPA's national quality assurance program.
3.1 Performance audits.
3.2 System audits.
4. Calculation requirements.
4.1 Automated methods.
4.1.1 Precision.
4.1.2 Accuracy.
4.2 Manual sampling methods.
4.2.1 Precision.
4.2.2 Accuracy.
5. Reporting requirements.
5.1 Data assessment report.
6. References.

1. ACTIVITIES TO DEMONSTRATE WITHIN CONTROL CONDITIONS

Each agency operating a State and local air monitoring stations (SLAMS) network must have a quality control program which includes quality control checks to demonstrate that measurements are made under acceptable conditions. Although not an actual requirement, use of quality control charts to record the results of quality control checks described in this section is strongly encouraged. This recommendation is made because the control limits specified are liberal and quality control charts provide a convenient and reliable means to determine when more restrictive limits can be reasonably imposed. The construction and use of quality control charts is discussed in detail in appendix H of reference 1.

1.1 Automated Methods.

1.1.1 Calibration requirements. Each analyzer must be calibrated during installation and recalibrated whenever any one of the following conditions occurs: (1) When control limit is exceeded for the span check described in section 1.1.2, (2) after repair of a malfunctioning analyzer, and (3) after replacement of major component(s) of an analyzer. Generate the calibration curve using zero and five upscale points equally spaced over the analyzer range. All gaseous calibration standards must be traceable to appropriate National Bureau of Standards standard reference materials (SRM) where they are available. One acceptable protocol to demonstrate traceability of calibration standards to SRM can be obtained by writing to: Quality Assurance Branch (MD-77), Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711.

1.1.2 Span check requirements. Periodic span checks are used to demonstrate that operational conditions are within control limits and to assess the precision of the data. A one-point span check must be carried out at least once per week on each analyzer at the following analyzer concentrations: (1) For SO_2, NO_2, and O_3 analyzers, between 0.08 and 0.10 ppm; and (2) for CO analyzers, between 8 and 10 ppm. In each case, determine the different between the known span concentration and the measured value predicted from the existing analyzer calibration curve. The acceptable limits for these differences are as follows: (1) for SO_2, NO_2, and O_3 analyzers and the limit is ±0.025 ppm; and (2) for CO analyzers the limit is ±2.0 ppm. Any time the control limit is exceeded, the analyzer must be removed from service, checks made to determine the cause and corrective action taken before return of the analyzer to service.

1.1.3 Episode monitoring requirements. Continuous monitors for SO_2, O_3, CO, and NO_2 used for monitoring during episodes as described in section 4.0 of appendix C of 40 CFR part 58, must be properly calibrated. Acceptable calibration can be demonstrated by performing a five point (plus zero) calibration, equally spaced over the analyzer range at the time of monitoring or by verifying a previous calibration with a span check at 50 to 80 percent of full scale. The acceptable difference between the span concentration and the measured value predicted from the existing calibration curve is ±7 percent. All gaseous calibration standards must be traceable to National Bureau of Standards standard reference materials (SRM).

A one point span check at 50 to 80 percent of full scale must be carried out at least once during the episode and at least once per week if the monitoring extends beyond 1 week. If the difference between the known span concentration and the measured value predicted from the existing calibration curve exceeds ±7 percent, a new five point (plus zero) calibration must be performed.

1.2 Manual sampling methods.

1.2.1 Total suspended particulate (TSP) reference method. (a) Sampling flow rate check. Initial flow rate readings must be observed for each sampler to determine whether corrective action is needed. The initial flow rate must be within ±15 percent of the established average initial flow rate as described in section 2.2.4, pages 10 and 11 of reference 2. If this limit is exceeded, recalibration or other corrective action is required.

(b) Exposed filter reweighing. A sample of randomly selected exposed filters is reweighed. Original and repeat weights must be within ±5.0 mg for the original weights of the entire lot of exposed filters to be acceptable. If any reweighed exposed filter differs more than 5.0 mg from its original weight, the entire lot of filters must be reweighed. See part 8.1.3 of section 2.2.8 of reference 2 for details.

(c) Recalculation of sample concentration. A sample of randomly selected calculated TSP values (in $\mu g/m^3$) is recalculated. If the original and repeat calculations do not agree, all calculations for the lot are checked and corrected as necessary. See part 8.1.4 of section 2.2.8 of reference 2 for details.

1.2.2 SO_2 reference method. (a) Temperature control. Temperature during sampling and during storage and transport following sampling must be maintained between 5° C and 25° C.

(b) Sampling flow rate check. Initial and final flow rate readings must be observed for each sampling system to determine whether corrective action is needed. If the change between the initial and final flow rate is more than 10 percent of the initial flow rate, corrective action is required. See section 2.1.5, pages 1 and 2, of reference 2 for details.

(c) Blank and standard solution analysis. A reagent blank and control standard (working sulfite-TCM solution and absorbing reagent) must be analyzed on the following schedule:

A reagent blank and a 1.0 μg SO_2/ml control standard must be analyzed before the first sample, after every subsequent 10th sample, and after the last sample. Each reagent blank absorbance must be within ±0.03 absorbance units of zero and each control standard must be 1±.07 μg SO_2/ml. If either limit is exceeded, recalibration or another corrective action must be completed and all sample reanalyzed. See section 2.1.5, pages 6–9 of reference 2 for details.

(d) Recalculation of sample concentration. A sample of randomly selected calculated SO_2 values (in $\mu g/m^3$) is recalculated. If the original and repeat calculations do not agree, all calculations for the lot must be checked and corrected as necessary. See part 8.1.3. of section 2.1.8 of reference 2 for details.

1.2.3 SO_2 Equivalent methods, EQS-0775-001 and EQS-0775-002 (manual sampling and automated analysis). Descriptions of these equivalent methods can be obtained by writing to: Department E, Environmental

Monitoring and Support Laboratory (MD-76), U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711.

(a) Temperature control. See section 1.2.2 (a).

(b) Sampling flow rate check. See section 1.2.2 (b).

(c) Blank and standard solution analysis. The analytical instrument used in equivalent methods EQS-0775-001 and EQS-0775-002 must be calibrated each day samples are analyzed and a calibration curve prepared. A reagent blank and a 1.0 μg SO_2/ml control standard must be analyzed after every 10th sample. The reagent blank is used to observe baseline drift. Each control standard must be 1±.055 μg SO_2/ml. If the limit for the control standard is exceeded, recalibration or another corrective action must be completed and the last 10 samples reanalyzed. See equivalent methods, sections 7.2 and 8.2 for details on calibration and quality control sample requirements, respectively.

(d) Recalculation of sample concentration. See section 1.2.2 (d).

.1.2.4 NO_2 Equivalent methods, EQN-1277-026, EQN-1277-027 and EQN-1277-028 (manual sampling and manual or automated analysis). Three methods have been designated as equivalent to the NO_2 reference method. The equivalent methods are EQN-1277-026 (sodium arsenite absorbing reagent and manual spectrophotometric analysis), EQN-1277-027 (sodium arsenite absorbing reagent and Technicon II automated analysis), and EQN-1277-028 (TGS-ANSA). Descriptions of these equivalent methods can be obtained by writing to Department E, at the address given in section 1.2.3.

(a) Sampling flow rate check. Requirements are the same as 1.2.2 (b).

(b) Blank and standard solution analysis. The analytical instrument used in equivalent method EQN-1277-026 must be calibrated each day samples are analyzed and a calibration curve prepared. A reagent blank and a 1.0 μg NO_2/ml control standard must be analyzed after every 10th sample. The reagent blank is used to observe baseline drift. Each control standard must be ±.10 μg NO_2/ml. If the limit for the control standard is exceeded, recalibration or another corrective action must be completed and the last 10 samples reanalyzed.

The analytical instrument used in equivalent method EQN-1277-027 must be calibrated each day samples are analyzed and a calibration curve prepared. A reagent blank and a 0.4 μg NO_2/ml control standard must be analyzed after every 10th sample. The reagent blank is used to observe baseline drift. Each control standard must be 0.4±.05 μg NO_2/ml. If the limit for the control standard is exceeded, recalibration or another corrective action must be completed and the last 10 samples reanalyzed.

The analytical instrument used in equivalent method EQN-1277-028 must be calibrated each day samples are analyzed and a calibration curve prepared. A reagent blank and a 1.0 μg NO_2/ml control standard must be analyzed after every 10th sample. The reagent blank is used to observe baseline drift. The reagent blank should be 0.01±0.02 absorbance units. The control standard must be 1±.10 μg NO_2/ml. If the limit for the control standard is exceeded, recalibration or another corrective action must be completed and the last 10 samples reanalyzed.

(c) recalculation of sample concentration. A sample of randomly selected calculated NO_2 values (in $\mu g/m^3$) is recalculated. If the original and repeat calculations do not agree, all calculations for the lot must be checked and corrected as necessary. Part 8.1.3 of section 2.1.8 of reference 2 can be used for guidance.

2. ASSESSMENT OF AGENCY PRECISION AND ACCURACY

2.1 Automated methods.

2.1.1 Precision. Periodic span checks are used to assess data from automated methods for precision. A one-point span check must be carried out at least once each week on each automated analyzer used to measure SO_2, NO_2, O_3 and CO. The concentration of the span gas used is the generated concentration (X) called for in item (a) of section 4.1.1 and the analyzer response is the measured response (Y) called for in item (a) of section 4.1.1. All automated analyzers designated by EPA as reference or equivalent methods and operated for SLAMS purposes must have this weekly span check. Only span check data from these continuous analyzers may be used to calculate agency precision.

2.1.2 Accuracy. Periodic independent audits are used to assess data from automated methods for accuracy. Independence is achieved by using audit standards and equipment different from those routinely used during method calibration. It is preferred that the audits be made by an operator/analyst who is different from the one conducting the routine analysis. If, however, circumstances dictate that the routine operator/analyst also be the auditor, the individual conducting the audit must not be provided beforehand with the value of the standard used in auditing.

All designated reference and equivalent automated analyzers that measure SO_2, NO_2, O_3 and CO are audited in the same way, that is, each analyzer is periodically challenged with a known concentration of pollutant gas at five levels. The differences in concentrations between audit values and measured analyzer values are used to assess the accuracy of the monitoring data as described in section 4.1.2.

For automated analzyers, once per calendar quarter, audit 25 percent of the reference or equivalent analyzers so that each of these analyzers will be audited at least once per year. If an agency operates less than four reference or equivalent analyzers, randomly select analyzers for reauditing so that one analyzer will be audited each calendar quarter and each analyzer will be audited at least once per year. A five-point audit must be carried out on each analyzer audited at the following concentrations: (1) For SO_2, NO_2 and O_3 analyzers, 0.05±0.01 ppm, 0.10±0.01 ppm, 0.20±0.01 ppm, 0.30±0.01 ppm, and 0.45±0.01 ppm; and (2) for CO analyzers 5±1 ppm, 10±1 ppm, 20±1 ppm, 30±1 ppm, and 45±1 ppm.

For each pollutant monitored, it is necessary to develop a means to provide the audit pollutant gas at five levels. The audit pollutant gases can be prepared in a manner similar to the preparation of the usual calibration gases. It is required, however, that the concentrations of pollutant gases in the audit gases be determined independently and that the standards used to calibrate the analyzers being audited not be used in the analysis of the audit gases. All audit gas standards must be traceable to National Bureau of Standards, Standard Reference Materials (SRM) as described in section 1.1.1 for calibration standards.

2.2 Integrated sampling methods.

2.2.1 Precision. Collocated samplers are used to assess data from manual sampling methods for precision. For a given agency's monitoring network, two sampling sites must have collocated samplers. Sites with the highest geometric mean concentration from the previous calendar year must be selected. The two samplers must be located at the same elevation and should be approximately 3 meters apart to preclude airflow interference. High-volume samplers should have the same roof orientation. For each pair of collocated samplers, one sampler must be randomly designated beforehand as the official sampler for normal routine monitoring purposes and the other must be designated as the duplicate sampler. Once designated, the identity of each sampler must be maintained. Calibration, sampling and analysis must be the same for both collocated samplers. The collocated samplers must be used each day the agency's monitoring network is operated. The differences in concentration ($\mu g/m^3$) between the official and duplicate samplers are used to calculate precision as described in section 4.2.1.

2.2.2 Accuracy. The assessment of accuracy of manual sampling methods is made by auditing a portion of the measurement process. The portion of the TSP method audited is the flow rate during sample collection. For the SO_2 and NO_2 methods, the portion audited is the analytical measurement.

(a) TSP method. Once per calendar quarter, audit the flow rate of 25 percent of the high-volume samplers such that each of these samplers will be audited at least once per year. If an agency operates less than four high-volume samplers, randomly select samplers for reauditing so that one sampler will be audited each calendar quarter and each sampler will be audited at least once per year.

The flow rate audit is conducted using a reference flow device described in part 8.1.2 of section 2.2.8 of reference 2. The reference flow device is an orifice having five different calibrated resistance plates that are mounted onto the faceplate of the high-volume sampler. It is required that the resistance plates be calibrated using flow standards different from those used to calibrate the flow of the high-volume samplers being audited. In conducting the audit, one of the resistance plates is selected and the audit flow rate is measured. This procedure is repeated, using different resistance plates, until the flow rate at five different levels is obtained. The differences in flow rates (m^3/min) between the calibrated resistance plate values and the measured sampler values are used to calculate accuracy as described in Item (a) of section 4.2.2.

(b) SO_2 methods. At least two audit samples must be analyzed each day that samples are analyzed with at least six audit samples analyzed per calendar quarter. Each audit is conducted using sulfite-TCM solutions with one audit sample at approximately 0.20 μg SO_2/ml and the second audit sample at approximately 0.80 μg SO_2/ml. The audit solutions are prepared from a

working sulfite-TCM solution as described in section 6.2.9. of the SO_2 reference method (reference 3). These audit samples must be prepared independently from the standardized sulfite solution used in the routine analysis procedure. New sulfite-TCM audit samples must be prepared every 30 days and must be stored between 0 and 5°C. The differences in concentrations (μg SO_2/ml) between the audit values and the analyst's measured values are used to calculate accuracy as described in item (c) of section 4.2.2.

(c) NO_2 methods. The specific requirements for auditing the analytical portion of the equivalent NO_2 methods follow. A minimum of two audit samples must be analyzed each day that samples are analyzed with at least six audit samples analyzed per calendar quarter.

Each audit is conducted using aqueous sodium nitrite solutions with one audit sample at approximately 0.20 μg NO_2/ml and the second audit sample at approximately 0.89 μg NO_2/ml. The audit solutions are prepared from a working sodium nitrite solution as described in the equivalent method. These audit samples must be prepared independently from the standardized nitrite solution used in the routine analysis procedure. New aqueous sodium arsenite audit samples must be prepared every 3 months. The differences in concentrations (μg NO_2/ml) between the audit values and the analyst's measured values are used to calculate accuracy as described in Item (c) of section 4.2.2.

3. PARTICIPATION IN EPA'S NATIONAL QUALITY ASSURANCE PROGRAM

Verification of agency estimates of monitoring data quality comes from a program of onsite surveys (commonly called system audits) and through external audits to measure the performance of the agency monitoring system (commonly called performance audits). In addition, it is the purpose of performance audits and system audits to identify agencies which have a problem so that appropriate corrective action ay be taken. Agencies must participate in the following EPA performance audits and system audits.

3.1 Performance audits. The Environmental Monitoring and Support Laboratory (EMSL/RTP) of EPA located at Research Triangle Park, N.C., conduct periodic blind sample performance audits for various pollutants. The purposes of these audits are: (1) To provide verification of the accuracy estimates of monitoring data generated by Each agency and reported to EPA; and (2) to provide each particpant with a measure of his performance. For criteria pollutants, performance audits are currently conducted: (1) Semi-annually for the analytical portions of sulfur dioxide and nitrogen dioxide integrated sampling methods using reference solutions; (2) semi-annually for sampling and analysis of carbon monoxide continuous methods using reference gases; and (3) annually for the flow rate of high-volume samplers using a reference flow device.

Instructions for participating in the performance audits can be obtained from the appropriate EPA Regional Quality Control Coordinator, or from the Quality Assurance Branch, EMSL/RTP at the address given in section 1.1.1.

3.2. System audits. Annually, EPA will conduct a system audit of the ambient air monitoring program of all agencies operating a SLAMS network within its region. This system audit, as defined in reference 1, is a systematic onsite qualitative review of the adequacy of the facilities, equipment, training, recordkeeping, validation, reporting, sampling, analysis and quality control procedures of the air pollution monitoring program. The purposes of the system audits are: (1) To provide verification that the capability exists for submitting quality monitoring data, and (2) to identify agency problems that may affect the gathering and reporting of quality monitoring data to EPA.

During the system audit, the required agency quality control activities described in sections 1 and 2 must be reviewed. In addition, many other agency activities should be reviewed. As an aid in the selection and review of other agency activities that may affect the gathering and reporting of quality monitoring data, the following document should be used: Criteria and procedures for the evaluation of ambient air monitoring programs, laboratory and field. A copy of this document may be obtained by writing to: Quality Assurance Branch, EMSL/RTP at the address given in section 1.1.1.

4. CALCULATION REQUIREMENTS

This section describes the calculations required to estimate agency precision and accuracy for automated methods and manual sampling methods. The estimates of precision and accuracy obtained will be optimistic. For example, span drift alone is used to estimate the precision of monitoring data from automated methods, yet other sources of imprecision exist. Also, the accuracy of monitoring data from manual sampling methods is estimated from audits of only portions of the total measurement process, e.g., flow measurement for TSP and analytical measurements for SO_2 and NO_2.

4.1 Automated methods.

4.1.1 Precision. Estimates of an agency's precision of ambient air quality measurements from automated methods are calculated from the results of weekly span checks as described in section 1.1.2. Each agency shall at the end of each calendar quarter, calculate and report a combined precision probability interval for all reference or equivalent analyzers for each pollutant. Directions for calculations are given below and directions for reporting are given in section 5. Do not include results from nonreference or nonequivalent analyzers in the calculation of precision estimates reported to EPA. If monitoring data is invalidated because span drifts exceeded the limits specified in section 1.1.2, do not include these span drift results in the calculations of estimates of precision given below:

(a) Single instrument precision. Let X_i represent the known concentration of the span gas and Y_i represent the measured concentration from the weekly span check. Calculate the percentage difference (d_i) for each span check using equation 1.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100 \quad (1)$$

For each instrument, calculate the quarterly average ($\bar{d}_j$), equation 2, and the standard deviation (S_j), equation 3.

$$\bar{d}_j = \sum_{i=1}^{n} d_i/n \quad (2)$$

$$S_j = \left[\frac{\sum_{i=1}^{n} d_i^2 - \left(\sum_{i=1}^{n} d_i\right)^2/n}{n-1}\right]^{1/2} \quad (3)$$

where n is the number of span checks of the instrument made during the calendar quarter. For example, n is 13 if span checks are made once during each of the 13 weeks in a quarter.

Calculate the 95 percent probability limits for precision using equations 4 and 5.

Upper 95 percent probability limit = $\bar{d}_j + 1.96\ S_j$ (4)

Lower 95 percent probability limit = $\bar{d}_j - 1.96\ S_j$ (5)

As an example, consider the following set of data from a CO analyzer:

Week	Measured concentration Y_i, parts per million	Known concentration X_i, parts per million	d_i percent
1	9.1	8.9	+2
2	8.5	8.9	−4
3	8.5	8.9	−4
4	8.6	8.9	−3
5	9.0	8.9	+1
6	8.9	8.9	0
7	9.0	8.9	+1
8	9.0	8.9	+1
9	9.0	8.9	+1
10	9.0	8.9	+1
11	8.7	8.9	−2
12	9.2	8.9	+3
13	9.4	8.9	+6
			Σ = +3

Applying equations 2 and 3,

$$\bar{d}_j = \frac{+3}{13} = +0.2\%$$

$$S_j = \left[\frac{99 - (3)^2/13}{12}\right]^{1/2} = 2.9\%$$

Applying equations 3 and 4,
Upper limit = 0.2 + 1.96(2.9) = 5.9 or +6%
Lower limit − 0.2 − 1.96(2.9) = −5.5 or −6%

(b) Agency precision. Calculate the average of averages (D) and pooled standard deviation (S_a) using equations 6 and 7,

$$\bar{D} = \sum_{j=1}^{k} \bar{d}_j/k \quad (6)$$

$$S_a = \left[\sum_{j=1}^{k} S_j^2/k\right]^{1/2} \quad (7)$$

where k is the number of instruments within an agency for a single pollutant.

Equations 6 and 7 assume that the same number of span checks are made for each instrument. If this is not true, use equations 6a and 7a to obtain a weighted average and a weighted standard deviation.

$$\bar{D} = \frac{n_1\bar{d}_1 + n_2\bar{d}_2 + \ldots + n_j\bar{d}_j + \ldots + n_k\bar{d}_k}{n_1 + n_2 + \ldots + n_j + \ldots + n_k} \quad (6a)$$

$$S_a = \left[\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2 + \ldots + (n_j-1)S_j^2 + \ldots + (n_k-1)S_k^2}{n_1 + n_2 + \ldots + n_j + \ldots n_k - k}\right]^{\frac{1}{2}} \quad (7a)$$

Calculate the 95-percent probability limits for agency precision using equations 8 and 9 and record these limits on form 1 (figure 5.1) under columns 31–36.

NOTE.—If only one analyzer is checked for a pollutant in a quarter, the results of equations 4 and 5 are reported as the agency precision values.

Upper 95 percent agency probability limit = $D + 1.96\ S_a$ (8)

Lower 95 percent agency probability limit = $D - 1.96\ S_a$ (9)

As an example, consider the following summaries of span drift data from five CO analyzers:

	Number of span checks	$\bar{d}_j$	S_j
Analyzer:			
1	13	+0.2	2.9
2	13	+.8	2.5
3	13	−.7	3.7
4	13	−2.0	5.1
5	13	−.1	1.6

Applying equations 6 and 7,

$\bar{D} = [0.2 + 0.8 - 0.7 - 2.0 - 0.1]/5 = -1.8/5 = -0.36$

$S_a^2 = [(2.9)^2 + (2.5)^2 + (3.7)^2 + (5.1)^2 + (1.6)^2]/5 = 56.92/5 = 11.38$

$S_a = 3.37$

Applying equations 8 and 9,

Upper limit $= -0.36 + 1.96\ (3.37) = 6.25$ or 6 percent

Lower limit $= -0.36 - 1.96\ (3.37) = -6.97$ or −7 percent

On form 1, −07 would be reported in columns 31–33 and +06 in columns 34–36.

The following example illustrates the case of an unequal number of span checks (n_j) per instrument.

	n_j	$\bar{d}_j$	S_j
Analyzer:			
1	13	−1.7	5.4
2	10	+.8	2.5
3	9	−.7	3.7
4	13	−2.0	5.1
5	12	−.1	1.6
	Σ=47		

Applying equations 6a and 7a,

$\bar{D} = [13(-1.7) + 10(0.8) + 9(-0.7) + 13(-2.0) + 12(-0.1)]/57 = -0.84$

$S_a^2 = [(12)(5.4)^2 + 9(2.5)^2 + 8(3.7)^2 + 12(5.1)^2 + 11(1.6)^2]/(57-5) = 855.97/52 = 16.46$

$S_a = 4.06$

Applying equations 8 and 9,

Upper Limit $= -0.84 + 1.96(4.06) = 7.12$ or 7 percent

Lower Limit $= -0.84 + 1.96(4.06) = -9.80$ or −9 percent

On Form 1, −09 would be reported in columns 31–33 and +07 in columns 34–36.

4.1.2 Accuracy. Estimates of an agency's accuracy of ambient air quality measurements from automated methods are calculated from the results of independent audits as described in section 2.1.2. Each agency shall, at the end of each calendar quarter, calculate and report a combined accuracy probability interval for all reference or equavalent analyzers for each pollutant. Directions for calculation are given below and directions for reporting are given in section 5. Do not include results from nonequivalent or nonreference analyzers in the calculation of accuracy estimates reported to EPA.

(a) Single instrument accuracy. Let X_i represent the known concentration of pollutant in the audit gas for the i^{th} audit point and Y_i represent the corresponding measured value of the i^{th} audit point. Calculate the percentage difference (d_i) for each audit point using equation 1. For each quarterly audit, calculate the average percentage difference ($\bar{d}_j$) and the standard deviation (S_j) using equations 2 and 3, respectively. Calculate the 95 percent probability limits for accuracy using equations 4 and 5.

(b) Agency accuracy. Using equation 6, calculate the average (D) of the average percent differences for all instruments audited. Using equation 3, compute the agency standard deviation (S_a) of all the individual percent differences for each audit point for all instruments. Note that the S_j of equation 3 becomes S_a because all of the individual percentage differences now include between-instrument variability as well as within-instrument variability.

As an example, consider the following data from the audits of two NO_2 analyzers.

	Y_i	X_i	$Y_i - X_i$	d_i
Analyzer:				
1	.053	.051	.002	3.9
	.107	.102	.005	4.9
	.212	.204	.008	3.9
	.321	.307	.014	4.6
	.480	.460	.020	4.3
				Σ=21.6
2	.049	.051	−.002	−3.9
	.097	.102	−.005	−4.9
	.194	.203	−.009	−4.4
	.291	.304	−.013	−4.3
	.437	.461	−.024	−5.2
				Σ=−22.7

Applying equation 2,

$\bar{d}_1 = 21.6/5 = 4.3$ percent

$\bar{d}_2 = -22.7/5 = -4.5$ percent

Applying equations 6 and 3,

$$\bar{D} = [4.3 + (-4.5)]/2 = -.10\%$$

$$S_a = \left[\frac{3.9^2 + \cdots + (-5.2)^2 - \frac{[3.9 + \cdots + (-5.2)]^2}{10}}{9}\right]^{\frac{1}{2}}$$

$$= \left[\frac{198.19 - \frac{(-1.1)^2}{10}}{9}\right]^{\frac{1}{2}} = 4.7\%$$

Calculate the 95 percent probability limits for agency accuracy using equations 8 and 9.

Upper 95 percent probability limits $= -.10 + 1.96(4.7) = 9.11$ or 9 percent

Lower 95 percent probability limits $= -.10 - 1.96(4.7) = -9.31$ or −9 percent

On Form 1, −09 would be reported in columns 42–44 and +09 in columns 45–47.

NOTE.—If only one instrument is audited during the quarter, the results from equations 4 and 5 are reported as the agency accuracy values.

4.2 Manual sampling methods.

4.2.1 Precision. Estimates of an agency's precision of ambient air quality measurements from manual sampling methods are calculated from the results obtained from collocation of two samplers as described in section 2.2.1. Each agency shall, at the end of each calendar quarter, calculate and report a combined precision probability interval for all reference or equivalent collocated samplers for each pollutant. Directions for calculation are given below and directions for reporting are given in section 5.

(a) Single instrument precision. From the paired measurements described in section 2.2.1, let Y_i represent the concentration of pollutant measured by the duplicate integrated sampler and X_i represent the calculation of pollutant measured by the designated official sampler during the i^{th} sampling period. Calculate the percentage difference (d_i) using equation 1. Calculate the average percentage difference (d_j) and standard deviation (S_j) using equations 2 and 3, respectively.

Calculate the 95 percent probability limits for precision using equations 10 and 11.

Upper 95 percent probability limits $= d_j + 1.96\ S_j/\sqrt{2}$ (10)

Lower 95 percent probability limits $= \bar{d}_j - 1.96\ S_j/\sqrt{2}$ (11)

As an example, consider the following TSP data, in $\mu g/m^3$, obtained using collocated high-volume samplers.

Sampling period	Y_i	X_i	$Y_i - X_i$	d_i
1	83.0	81.9	1.10	1
2	119.9	113.6	6.30	6
3	.....	137.8	.....	.....
4	128.4	122.7	5.70	5
5	118.5	116.4	2.10	2
6	161.6	158.9	2.70	2
7	127.9	129.0	−1.10	−1
8	137.5	134.2	3.30	2
9	118.0	113.4	4.60	4
				Σ=21

Applying equations 2 and 3,

$d_j = 21/8 = 2.6$ percent

$$S_j = \left[\frac{91 - (21)^2/8}{7}\right]^{\frac{1}{2}} = 2.3\%$$

The resulting upper 95 percent probability limit, equation 10 is:

$\bar{d}_j + 1.96\ S_j/\sqrt{2} = 2.6 + 1.96(2.3)/\sqrt{2} = 2.6 + 3.2 = 5.8$ percent.

The resulting lower 95 percent probability limit, equation 11 is:

$\overline{d_j} - 1.96\ S_j/\sqrt{2} = 2.6 - 1.96(2.3)/\sqrt{2} = 2.6 - 3.2 = -0.6$ percent.

Under some circumstances agreement between the results of collocated samplers, expressed as 95 percent probability limits, may be poor. For this reason a separate count is made of the occurrence of pollutant levels below specified levels. Count the number of samples from the collocated sites with results from the designated sampler that are below the following limits:

TSP—less than 20 $\mu g/m^3$
SO_2—less than 40 $\mu g/m^3$
NO_2—less than 30 $\mu g/m^3$

Report the counts on columns 29-32 of form 1.

(b) Agency precision. Although only two pairs of collocated samplers are required to estimate agency precision, additional collocated sampling is encouraged. Results from all sampling sites should be reported. Calculate the average percentage difference ($\overline{D}$) and pooled standard deviation (S_a) using equations 6 and 7, respectively.

Calculate the 95 percent probability limits for agency precision using equations 12 and 13.

Upper 95 percent probability limit $= D + 1.96\ S_a/\sqrt{2}$ (12)

Lower 95 percent probability limit $= \overline{D} - 1.96\ S_a/\sqrt{2}$ (13)

As an example, assume the following information is available from two pairs of collocated TSP samplers.

$\overline{d_1} = 2.6 \qquad \overline{d_2} = 5.8$
$S_1 = 2.3 \qquad S_2 = 3.7$
$\overline{D} = (2.6 + 5.8)/2 = 4.22$

$$S_a = \left[\frac{(2.3)^2 + (3.7)^2}{2}\right]^{\frac{1}{2}} = 3.08$$

Applying equations 12 and 13,

Upper 95 percent probability limit $= 4.22 + 1.96(3.08)/\sqrt{2} = 8.49$ or 8 percent

Lower 95 percent probability limit $= 4.22 - 1.96(3.08)/\sqrt{2} = -0.05$ or 0 percent

On form 1, 00 would be reported in columns 33-35 and +08 in columns 36-38.

4.2.2 Accuracy. (a) Single instrument accuracy (TSP). For each of the flow rate audits described in section 2.2.2(a), let X_i represent the known flow rates for each resistance plate and Y_i represent the measured flow rates. Calculate the percentage difference (d_i) for each flow rate using equation 1. For each audit, calculate the average percent difference ($\overline{d_j}$) and the standard deviation (S_j) using equations 2 and 3, respectively. Calculate the 95 percent probability limits for accuracy using equations 4 and 5.

(b) Agency accuracy (TSP). Calculate the average ($\overline{D}$) of the average percent differences for all high-volume instruments audited using equation 6. Compute the standard deviation (S_a) of all the individual percentage differences for each audit point for all of the instruments audited using equation 3. Note that S_j of equation 3 becomes S_a because all of the individual percentage differences now include between-instrument variability as well as within-instrument variability.

Calculate the 95 percent probability limits for agency accuracy using equations 8 and 9 and record these limits on form 1 under columns 44-49.

NOTE.—If only one instrument is audited during the quarter, the results from equations 4 and 5 are reported as the agency accuracy values.

(c) Single analysis day accuracy (SO_2 and NO_2). For each of the audits of the analysis for SO_2 or NO_2 described in section 2.2.2. (b) and (c), let X_i represent the known value of the audit sample and Y_i the measured value of SO_2 or NO_2.

Calculate the percentage difference (d_i) for each audit using equation 1. Calculate the average percent difference ($\overline{d_j}$) for each analysis day using equation 2.

(d) Agency accuracy (SO_2 and NO_2). Calculate the average ($\overline{D}$) of the average percent differences for all analysis days during a quarter using equation 6. Compute the standard deviation (S_a) of the individual percentage differences using equation 3. Note that S_j of equation 3 becomes S_a because all of the individual percentage differences now include between-instrument variability as well as within-instrument variability.

Calculate the 95 percent probability limits for agency accuracy using equations 8 and 9 and record these limits on form 1 under column 44-49.

5. REPORTING REQUIREMENTS

This section discusses the flow of quality assessment reports from the state and local agencies to EPA. Estimates of precision and accuracy must be submitted to EPA from each of the agencies for each of the criteria pollutants. These estimates of data quality, together with participation in EPA's national quality assurance program constitute an agency's data quality assessment program. The data assessment report (form 1, figure 5.1) must be submitted to the EPA regional office (RO) along with the monitoring data from SLAMS.

The data assessment report is designed to record conveniently each agency's summarized estimates of precision and accuracy. The form ties the data to the agency's SAROAD number (State and area digits), number of monitors and 95 percent probability limits for both precision and accuracy determination. If the estimates of data quality exceed the amount of space provided, fill the available space with 9's.

Estimates of data quality will not be reported simultaneously with standard SAROAD retrievals. Whenever the reported results disagree significantly with EMSL/RTP's audit, a notion will appear in the annual data assessment reports prepared by EMSL/RTP. In addition, individual results will be sent each agency following an audit for more timely utilization of the information.

5.1 Data reporting. The following information describes how to fill out form 1. Numbers refer to the numbers on the form.

NUMBER AND DESCRIPTION

1-2 *Agency:* These blocks identify the agency conducting the monitoring. The name of the agency should be written out below the codes.

3-4 *Year:* Last two digits of the calendar year.

5 *Quarter:* 1, 2, 3, or 4—referring to the calendar quarter the monitoring data and quality assessments were made.

6-11 *SAROAD No.:* The first six digits of the SAROAD State and area code. If more than one area is represented by the agency reporting the results (e.g., if the State does all of the reporting), fill in the blocks with 9's.

12-17 *Laboratory code ID:* These codes have been assigned to each laboratory participating in the EMSL/RTP audit program. If a code has not been assigned, call the regional quality control coordinator in your region.

CONTINUOUS ANALYZERS

18-23 *Pollutant identifiers:* Precoded.

24-26 *Number of analyzers:* Count only the number of analyzers that report monitoring data for each pollutant.

27-30 *Number of spans:* Count the total number of spans included in the calculations reported.

31-33 *Lower 95 percent limit, precision:* Block 31 is either "+" or "−". Blocks 32-33 contain the percentage (round off to a whole number) obtained from equation 9.

34-36 *Upper 95 percent limit, precision:* Block 34 is either "+" or "−". Blocks 35-36 contain the percentage obtained from equation 8.

NOTE.—If precision limits exceed two digits, e.g., 103 percent, report as *99.*

37-38 *Source of audit gas:* For accuracy determination, refer to code table, note 3, on the form.

39-41 *Number of audits:* Report the total number of multipoint audits performed on the analyzers reported in blocks 24-26.

42-44 *Lower 95 percent limit, accuracy:* Block 42 is either "+" or "−". Blocks 43-44 contain the percentages obtained from equation 9.

45-47 *Upper 95 percent limit, accuracy:* Block 45 is either "+" or "−". Blocks 46-47 contain the percentage obtained from equation 8.

NOTE.—If accuracy limits exceed two digits, e.g., 103 percent, report as *99.* Report as required for all pollutants (CO, NO_2, O_3, and SO_2) as determined by continuous analyzers. A blank line, E, is provided for future expansion to additional pollutants.

INTEGRATED SAMPLERS

18-23 *Pollutant identifiers:* Precoded.

24-26 *Number of samplers:* Count only the number of samplers for each pollutant that reports monitoring data as part of a routine monitoring program.

27-28 *Number of collocated sites:* Sites with collocated samplers. The minimum number is 2.

29-32 *Number of collocated samples below the limit:* Count the number of samples from the collocated sites with results from the designated sampler that are below the following limits:

TSP—less than 20 μg TSP/m^3
SO_2—less than 40 μg SO_2/m^3
NO_2—less than 30 μg NO_2/m^3

33-35 *Lower 95 percent limit, precision:* Block 33 is either "+" or "−". Blocks 34-35 contain the percentage obtained from equation 9.

36-38 *Upper 95 percent limit, precision:* Block 36 is either "+" or "−". Blocks 37-

38 contain the percentage obtained from equation 8.

NOTE.—If precision limits exceed two digits, e.g., 103 percent, report as *99*.

39–40 *Type of accuracy check:* Code from note 4 on the form.

41–43 *Number of audits:* Count the total number of audits performed on the entire network for the pollutant. A single audit may consist of several audit level checks, but count only once for each audit. For example, an audit conducted at a site for TSP flow at five flow plate settings, the number of count is 1, not 5. Similarly, for SO_2 and NO_2, six audit samples checked on three different analysis days, the number to report is 3, not 6.

44–46 *Lower 95 percent limit, accuracy:* Block 44 is either "+" or "−". Blocks 45–46 contain the percentage obtained from equation 9.

47–49 *Upper 95 percent limit, accuracy:* Block 47 is either "+" or "−". Blocks 48–49 contain the percentage obtained from equation 8.

NOTE.—If accuracy limits exceed two digits, e.g., 103 percent, report as *99*.

Report, as required, all pollutants (TSP, SO_2, and NO_2) as determined by manual sampling methods samplers. A blank line, D, is provided for future expansion to additional pollutants.

DATA ASSESSMENT REPORT

SEND COMPLETED FORM TO REGIONAL OFFICE WITH QUARTERLY SAROAD DATA

AGENCY [1] (1 2) YEAR (3 4) QUARTER (5) SAROAD NUMBER STATE AREA (6 7 8 9 10 11) LAB CODE ID (12 13 14 15 16 17)

NAME:

AUTOMATED ANALYZERS		NO. OF ANALYZERS [2] (24-26)	PRECISION: NO. OF SPAN (27-30)	PRECISION: 95% LIMIT LOWER (31-36)	PRECISION: 95% LIMIT UPPER (31-36)	ACCURACY: SOURCE OF AUDIT GAS [3] (37-38)	ACCURACY: NO. OF AUDITS (39-41)	ACCURACY: 95% LIMIT LOWER (42-47)	ACCURACY: 95% LIMIT UPPER (42-47)
A. CO	C 4 2 1 0 1 (18-23)			+/-	+/-			+/-	+ -
B. NO_2	C 4 2 6 0 2 (18-23)			+/-	+/-			+/-	+ -
C. O_3	C 4 4 2 0 1 (18-23)			+/-	+/-			+/-	+ -
D. SO_2	C 4 2 4 0 1 (18-23)			+/-	+/-			+ -	+ -
E. ___	C (18-23)			+/-	+/-			+/-	

MANUAL METHODS		NO. OF SAMPLERS [2] (24-26)	PRECISION: NO. OF COLLOCATED SITES (27-28)	PRECISION: NO. OF COLLOCATED SAMPLES < LIMIT (29-32)	PRECISION: 95% LIMIT LOWER (33-38)	PRECISION: 95% LIMIT UPPER (33-38)	ACCURACY: TYPE CHECK [4] (39-40)	ACCURACY: NO. OF AUDITS (41-43)	ACCURACY: 95% LIMIT LOWER (44-49)	ACCURACY: 95% LIMIT UPPER (44-49)
A. TSP	I 1 1 1 0 1 (18-23)				+/-	+/-			+/-	+ -
B. SO_2	I 4 2 4 0 1 (18-23)				+/-	+/-			+/-	+ -
C. NO_2	I 4 2 6 0 2 (18-23)				+/-	+/-			+/-	+ -
D. ___	I (18-23)				+/-	+/-			+/-	

[1] CODE USING THE FOLLOWING
01 - 10 REGIONAL MONITORING PROGRAM
11 STATE AGENCY
12 COUNTY
13 CITY
14 DISTRICT
15 OTHER

[2] COUNT ONLY REFERENCE OR EQUIVALENT MONITORING SYSTEMS

[3] CODE USING THE FOLLOWING:
A. NBS SUPPLIED SRM
B. EMSL REFERENCE GAS
C. OTHER (IDENTIFY VENDOR) CO ___
D. OTHER (IDENTIFY VENDOR) NO_2 ___
E. OTHER (IDENTIFY VENDOR) O_3 ___
F. OTHER (IDENTIFY VENDOR) SO_2 ___

[4] CODE USING THE FOLLOWING
A. EMSL REFERENCE FLOW DEVICE
B. EMSL REFERENCE MATERIAL
C. OTHER (SPECIFY) TSP ___
D. OTHER (SPECIFY) SO_2 ___
E. OTHER (SPECIFY) NO_2 ___

FIGURE 5.1 FORM 1

6. REFERENCES

1. Quality Assurance Handbook for Air Pollution Measurement Systems—Volume I, Principles. EPA-600/9-76-500, March 1976. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD-77), Research Triangle Park, N.C. 27711.

2. Quality Assurance Handbook for Air Pollution Measurement Systems—Volume II, Ambient Air Specific Methods. EPA-600/4-77-027a, May 1977. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory (MD-77), Research Triangle Park, N.C. 27711.

3. 40 CFR Part 50, Appendix A, Reference Method for the Determination of Sulfur Dioxide in the Atmosphere (Pararosaniline Method).

APPENDIX B—QUALITY ASSURANCE REQUIREMENTS FOR PREVENTION OF SIGNIFICANT DETERIORATION (PSD) AIR MONITORING

1. Introduction.
2. Organization quality control requirements.
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2.4 Activities to assess monitoring data precision and accuracy for continuous methods.
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1. INTRODUCTION

The activities described here are the minimum quality assurance requirements for an organization operating a PSD network to produce monitoring data acceptable to the Environmental Protection Agency (EPA). Although not a requirement, use of quality control charts to record the results of quality control checks as described in section 2.1 and to aid in attaining in-control conditions is strongly encouraged. This recommendation is made because the control limits given for the activities of section 2.1 are liberal and the development of more restrictive control limits by each organization is encouraged. Quality control charts provide a convenient and reliable means to determine when more restrictive control limits can be reasonably imposed. The construction and use of quality control charts is discussed in detail in appendix H of reference 1.

Frequent use is made of the term "organization." For purposes here, "organization" is defined as a source owner/operator, a government agency, or their contractor which operates an ambient air pollution monitoring network for PSD purposes.

2. ORGANIZATION QUALITY CONTROL REQUIREMENTS

Each organization responsible for operating a PSD network must have a quality control program which includes the following two items: (1) Activities to demonstrate that measurements are made within acceptable control conditions; and (2) assessment of organization's monitoring data for precision and accuracy.

2.1 Activities to demonstrate within control conditions for continuous methods.

2.1.1 Reference or equivalent method requirements. All continuous analyzers must be EPA designated reference or equivalent methods. A list of reference and equivalent methods can be obtained by writing to: Department E, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (MD-76), Research Triangle Park, N.C. 27711.

2.1.2 Calibration requirements. Continuous analyzers must be calibrated during installation and recalibrated whenever any one of the following conditions occur: (a) Control limit is exceeded for the span check described in Section 2.1.3; (b) after repair of a malfunctioning analyzer; and (c) after replacement of major component(s) of an analyzer. A minimum of five calibration points equally spaced over the analyzer range, plus zero must be used to generate a calibration curve. All gaseous calibration standards must be traceable to National Bureau of Standards' gaseous Standard Reference Materials (SRM). One acceptable protocol to demonstrate traceability of calibration standards to SRM can be obtained by writing to: Quality Assurance Branch, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (MD-77), Research Triangle Park, N.C. 27711.

2.1.3 Span check requirements. For continuous analyzers, a periodic span check is used as the activity to demonstrate within control conditions and is also used to assess the data for precision. A one-point span check must be carried out at least once per week on each analyzer. The one-point span check must be carried out at the following analyzer concentrations: (a) For SO_2, NO_2 and O_3 analyzers, between 0.08 and 0.10 ppm; and (b) for CO analyzers, between 8 and 10 ppm. In each case, determine the difference between the known span concentration and the measured concentration from the existing calibration curve. The acceptable limits for these differences are as follows: (a) for SO_2, NO_2 and O_3 analyzers the limit is ± 0.025 ppm; and (b) for CO analyzers the limit is ± 2.0 ppm.

The analyzer must be removed from ambient monitoring, checks made to determine the cause and corrective action taken before return of the analyzer to ambient monitoring any time the control limit is exceeded. After return of the analyzer to ambient monitoring, the recalibration of the analyzer with a minimum of five calibration points equally spaced over the analyzer range plus zero is required.

The weekly span check data also generates information to assess the precision of the monitoring data; see section 3.1.1 for procedures to be followed for calculating and reporting precision.

2.2 Activities to demonstrate within control conditions for integrated sampling methods.

2.2.1 Total suspended particulate (TSP) reference method (high-volume sampler). (a) Sampling flow rate check. Initial flow rate readings must be observed for each sampler and used to determine when corrective action is needed. The initial flow rate must be within ± 15 percent of the established average initial flow rate. If this limit is exceeded, recalibration or other corrective action is required. See section 2.2.4 pages 10 and 11 of reference 2 for details.

(b) Exposed filter reweighing. A sample of randomly selected exposed filters (filters after sampling) is reweighed. Agreement between original and repeat weights must be ± 5.0 mg or less in order to accept the original weights of the entire lot of exposed filters. If any reweighed exposed filter differs more than 5.0 mg from its original weight, the entire lot of filters must be reweighed. See part 8.1.3 of section 2.2.8 of reference 2 for details.

(c) Recalculation of sample concentration. A sample of randomly selected calculated TSP values (in $\mu g/m^3$) is recalculated. The original and repeat calculations must agree. If this criterion is not met, all calculations for the lot are checked and corrected as necessary. See part 8.1.4 of section 2.2.8 of reference 2 for details.

2.3 General description of activities to assess monitoring data precision and accuracy.

Descriptions of specific activities to assess monitoring data for precision and accuracy by individual instruments follow in sections 2.4 and 2.5. Calculation and reporting procedures for precision and accuracy are described in section 3.

Precision is calculated from periodic checks made by the routine operator/analyst during the normal operation of the method.

Accuracy is calculated from audits. Audits, as used here, mean independent assessments of the quality of the data obtained in an organization's monitoring program. Independence is achieved by using personnel, audit standards and equipment different from those routinely used during method calibration. As a minimum, the audit personnel must be different from the routine operator/analyst conducting the routine operation of the measurement method. It is preferred, but not required, that a different organization from the one operating the measurement method conduct the audit.

2.4 Activities to access monitoring data precision and accuracy for continuous methods.

2.4.1 Assessment of data for precision. Periodic span checks are used to assess continuous monitoring data for precision. A one-point span check must be carried out each week on continuous analyzers used to measure SO_2, NO_2, O_3 and CO. The concentration for this span check is described in section 2.1.3. The concentration for the span gas used is the generated concentration (X), and the analyzer response is the measured response (Y) in the calaculations shown in section 3.1.1. All continuous ana-

lyzers must have this span check performed at least weekly.

2.4.2 Assessment of data for accuracy. Periodic independent audits are used to assess continuous monitoring data for accuracy. Continuous analyzers that measure SO_2, NO_2, O_3 and CO are all audited in the same way. The audit described here applies equally to all designated continuous methods, reference and equivalent. The audit required is the periodic challenge of the continuous analyzers with known concentrations of pollutant gas at five levels. The results of the audit are used in assessing the accuracy of the monitoring data. The procedure for calculation of accuracy is described in section 3.1.2.

For each pollutant monitored, it is necessary to develop a means to provide the audit pollutant gas at five levels. The audit pollutant gases can be prepared in a manner similar to the preparation of the usual calibration gases. It is required, however, that the concentrations of pollutant gases in the audit gases be determined independently and that the standards used to calibrate the analyzers being audited not be used in the analysis of the audit gases. All audit gas standards must be traceable to National Bureau of Standards' gaseous Standard Reference Materials (SRM). One acceptable protocol to demonstrate traceability of audit gas standards to SRM is referenced in section 2.1.2.

The specific requirements for auditing continuous analyzers follow: once per sampling quarter, each reference or equivalent analyzer must be audited. A five-point audit must be carried out on each analyzer. The five-point audit must be carried out at the following analyzer concentrations: (a) for SO_2, NO_2, and O_3 analyzers, 0.05±0.01 ppm, 0.10±0.01 ppm, 0.20±0.01 ppm, 0.30±0.01 ppm, and 0.45±0.01 ppm; and (b) for CO analyzers, 5±1 ppm, 10±1 ppm, 20±1 ppm, 30±1 ppm, and 45±1 ppm. The differences in concentrations (ppm) between the audit values and the measured analyzer values are used to calculate accuracy as described in section 3.1.2.

2.5 Activities to assess monitoring data precision and accuracy for integrated sampling methods.

2.5.1 Assessment of data for precision. Collocated samplers are used to assess data from integrated sampling methods described in section 2.2. For a given organization's monitoring network, one sampling site must have collocated samplers. A site with the highest expected 24-hour pollutant concentration must be selected. The two samplers must be located at the same elevation and should be approximately 3 meters apart to preclude air flow interference. High-volume samplers should have the same roof orientation. For the pair of collocated samplers, one sampler must be randomly designated prior to the collection of samples as the official sampler for normal routine monitoring purposes and the other will be designated as the duplicate sampler. Once designated, the indentity of each sampler must be maintained. Sampling, calibration, operation and analysis must be the same for both collocated samplers. The collocated sampler must be operated as a minimum every third day when continuous sampling is used. When a less frequent sampling schedule is used, the collocated sampler must be operated at least once each week. The difference in concentration ($\mu g/m^3$) between the official and duplicate samplers is used to calculate precision as described in section 3.2.1.

2.5.2 Assessment of data for accuracy. The assessment of accuracy for integrated sampling methods is made by auditing a portion of the measurement process.

(a) TSP method. The portion of the TSP method audited is the flow rate during sample collection. The specific requirements for auditing the flow rate of high-volume samplers follow: Once per sampling quarter, audit the flow rate of each high-volume sampler. The flow rate calibration audit is conducted using a reference flow device described in part 8.1.2. of section 2.2.8 of reference 2. The reference flow device is an orifice having five different calibrated resistance plates that are mounted onto the faceplate of the high-volume sampler. In conducting the audit, one of the resistance plates is selected and the audit flow rate is measured. This procedure is repeated, using different resistance plates, until the flow rate a five different levels is obtained. The differences in flow rates (m^3/min) between the calibrated resistance plate values and the measured sampler values are used to calculate accuracy as described in section 3.2.2.

3. ORGANIZATION CALCULATION AND REPORTING REQUIREMENTS FOR PRECISION AND ACCURACY

Calculating and reporting estimates of precision and accuracy of ambient air quality data gathered by organizations operating PSD monitoring networks is described in this section. Precision and accuracy must be calculated each sampling quarter for each measurement instrument using information obtained in section 2. The computed precision and accuracy must be recorded on the Data Assessment report (table 3.3.1) and adjoined with the quarterly submission of monitoring data.

3.1 Calculations for continuous methods.

3.1.1 Single instrument precision. Estimates of precision for ambient air quality measurements from continuous methods are calculated from the results of weekly span checks as described in section

2.1.3. Each organization, at the end of each sampling quarter, calculates and reports a precision probability interval for each reference or equivalent analyzer. Directions for calculations are given below and directions for reporting are given in section 3.3. If monitoring data is invalidated because span drifts exceeded the limits specified in section 2.1.3, do not include these span drift results in the calculations of estimates of precision given below for single instrument precision.

Let X_i represent the known concentration of the span gas, and Y_i represent the measured concentration from the weekly span check. Calculate the percentage difference (d_i) for each span check using equation 1.

$$d_i = \frac{Y_i - X_i}{X_i} \times 100 \qquad (1)$$

For each instrument, calculate the quarterly average ($\bar{d}_j$), equation 2, and the standard deviation (S_j), equation 3.

$$\bar{d}_j = \sum_{i=1}^{n} d_i/n \qquad (2)$$

$$S_j = \left[\frac{\sum_{i=1}^{n} d_i^2 - \left(\sum_{i=1}^{n} d_i\right)^2/n}{n-1}\right]^{1/2} \qquad (3)$$

where n is the number of span checks of the instrument made during the sampling quarter. For example, n is 13 if span checks are made once during each of the 13 weeks in a quarter.

Calculate the 95 percent probability limits for precision using equations 4 and 5.

Upper 95 percent probability limit = $\bar{d}_j + 1.96\ S_j$ (4)

Lower 95 percent probability limit = $\bar{d}_j - 1.96\ S_j$ (5)

As an example, consider the following set of data from a CO analyzer:

Week	Measured concentration Y_i parts per million	Known concentration X_i parts per million	Difference, d_i percent
1	9.1	8.9	+2
2	8.5	8.9	−4
3	8.5	8.9	−4
4	8.6	8.9	−3
5	9.0	8.9	+1
6	8.9	8.9	0
7	9.0	8.9	+1
8	9.0	8.9	+1
9	9.0	8.9	+1
10	9.0	8.9	+1
11	8.7	8.9	−2
12	9.2	8.9	+3
13	9.4	8.9	+16
			Σ=+3

Applying equations 2 and 3:

$\bar{d}_j = +3/13 = +0.2\%$ (2)

$$S_j = \left[\frac{99 - (3)^2/13}{12}\right]^{1/2} = 2.9\% \qquad (3)$$

Applying equations 4 and 5:

Upper limit=0.2+1.96(2.9)=5.9 or +6 percent (4)

Lower limit=0.2−1.96(2.9)=−5.5 or −6 percent (5)

On the Data Assessment Report (Table 3.3.1), −6 is reported for the lower 95 percent limit, and +6 is reported for the upper 95 percent limit for the CO analyzer precision.

3.1.2 Single instrument accuracy. Estimates of accuracy for ambient air quality measurements from continuous methods are calculated from the results of independent audits as described in section 2.4.2. Each organization, at the end of each sampling quarter, calculates and reports an accuracy probability interval for each reference or equivalent analyzer. Directions for calculation are given below and directions for reporting are given in section 3.3.

Let X_i represent the known concentration of pollutant in the audit gas for the i^{th} audit point, and Y_i represent the corresponding measured value of the i^{th} audit point. Calculate the percentage difference (d_i) for each audit point using equation 1. For each quarterly audit, calculate the average percentage difference ($\bar{d}_j$) and the standard deviation (S_j) using equations 2 and 3, respectively. Calculate the 95 percent probability limits for accuracy using equations 4 and 5.

As an example, consider the following data from the audit of an NO_2 analyzer:

Audit point	Measured concentration Y_i parts per million	Known concentration X_i parts per million	Difference, d_i percent
1	.053	.051	3.9
2	.107	.102	4.9
3	.212	.204	3.9
4	.321	.307	4.6
5	.480	.460	4.3
			Σ=+21.6

Applying equations 2 and 3:

$\bar{d}_j$=+21.6/5=4.3 percent (2)

$$S_j = \left[\frac{94.08 - (21.6)^2/5}{4}\right]^{\frac{1}{2}} = 0.44\% \quad (3)$$

Applying equations 4 and 5:

Upper Limit=4.3+1.96(0.44)=5.2 or +5 percent (4)

Lower Limit=4.3+1.96(0.44)=3.4 or 3 percent (5)

On the data assessment report, +3 is reported for the lower 95 percent limit and +5 percent is reported for the upper 95 percent limit for the NO_2 analyzer accuracy.

3.2 Calculations for integrated sampling methods.

3.2.1 Single instrument precision for TSP. Estimates of precision for ambient air quality measurements from the TSP method are calculated from results obtained from the collocation of two samplers at one sampling site as described in section 2.5.1. Each organization, at the end of each sampling quarter, calculates and reports a precision probability interval using weekly collocation sampler results. The calculated precision at the one sampling site is indicative of the precision at all sampling sites for the TSP method. Directions for calculation are given below and directions for reporting are given in section 3.3.

From the paired measurements described in section 2.5.1, let Y_i represent the concentration of pollutant measured by the duplicate integrated sampler and X_i represent the calculation of pollutant measured by the designated official sampler during the i^{th} sampling period. Calculate the percentage difference (d_i) using equation 1. Calculate the average percentage difference ($\bar{d}_j$) and standard deviation (S_j) using equations 2 and 3, respectively. Calculate the 95 percent probability limits for precision using equations 6 and 7.

Upper 95 percent probability limit=$\bar{d}_j$+1.96 $S_j/\sqrt{2}$ (6)

Lower 95 percent probability limit=$\bar{d}_j$+1.96 $S_j/\sqrt{2}$ (7)

As an example, consider the following TSP data obtained using collocated high-volume samplers.

Sampling week	Duplicate sampler, $Y_i\mu g/m^3$	Official sampler, $X_i\mu g/m^3$	Difference, d_i percent
1	53.0	51.9	2
2	69.9	66.6	5
3		67.8	
4	58.4	55.7	5
5	48.5	46.4	5
6	61.6	58.9	5
7	57.9	59.0	−2
8	67.5	64.2	5
9	58.0	55.4	5
10	55.0	59.0	−4
11	60.0	58.1	3
12	55.8	53.1	5
13	51.4	52.8	−3
			Σ=+31

Applying equations 2 and 3:

d_j=+31/12=2.6 percent (2)

$$S_j = \left[\frac{217 - (31)^2/12}{11}\right]^{\frac{1}{2}} = 3.5\% \quad (3)$$

Applying equations 6 and 7:

Upper limit=2.6+1.96(3.5)/$\sqrt{2}$=7.4 of 7 percent (6)

Lower limit=2.6−1.96(3.5/$\sqrt{2}$=−2.3 or −2 percent (7)

On the data assessment report (table 3.3.1), −2 is reported for the lower 95 percent limit, and +7 is reported for the upper 95 percent limit for the TSP sampler precision.

3.2.2. Single instrument accuracy for TSP. Estimates of accuracy for ambient air quality measurements from the TSP method are calculated from the results of independent audits as described in section 2.5.2. Once each sampling quarter, the flow rate of each high-volume sampler is audited. Each organization, at the end of each sampling quarter, calculates and reports an accuracy probability interval for each TSP sampler. Directions for calculation are given below and directions for reporting are given in section 3.3.

Let X_i represent the known flow rate for each resistance plate, and Y_i represent the measured flow rate. Calculate the percentage difference (d_i) for each flow rate using equation 1. For each quarterly audit, calculate the average percent difference (d_j) and the standard deviation (S_j) using equations 2 and 3, respectively. Calculate the 95 percent probability limits for accuracy using equations 4 and 5.

As an example, consider the following data from the audit of a TSP sampler:

Resistance plate No.	Measured flow rate, Y_i m^3/min (cfm)	Known flow rate, X_i m^3/min (cfm)	Difference, d_i percent
13	1.53(53.9)	1.47(52.0)	4
10	1.39(49.1)	1.34(47.2)	4
7	1.21(42.8)	1.11(39.1)	9
18	1.73(61.0)	1.68(59.3)	3
5	0.99(34.9)	0.93(32.8)	6
			Σ=+26

Applying equations 2 and 3:

d_j=+26/5=5.2 percent (2)

$$S_j = \left[\frac{158 - (26)^2/5}{4}\right]^{\frac{1}{2}} = 2.4\% \quad (3)$$

Applying equations 4 and 5:

Upper limit=5.2+1.96(2.4)=9.9 or 10 percent (4)

Lower limit=5.2−1.96(2.4)=0.5 or 1 percent (5)

On the data assessment report (table 3.3.1), +1 is reported for the lower 95 percent limit and +10 is reported for the upper 95 percent limit for TSP sampler accuracy.

3.3 Organization reporting requirements. At the end of each sampling quarter, the organization must calculate precision and accuracy for each continuous analyzer and each TSP sampler, and record the calculated results on part I of the data assessment report (table 3.3.1). In addition, for each audit of a continuous analyzer (CO, NO_2, O_3 and SO_2), record the five audit concentrations and the difference between the measured concentration and the known (audit) concentration on part II of the data assessment report. The quarterly data assessment report must be submitted with the air monitoring data. All data used to calculate reported estimates of precision and accuracy including span check, collocated sampler and audit results must be made available to the permit granting authority upon request.

The results from the example calculations in section 3.1 and 3.2 have been recorded on table 3.3.1 to illustrate how to complete the data assessment report.

4. REFERENCES

1. Environmental Monitoring and Support Laboratory, "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I—Principles," U.S. Environmental Protection Agency (MD-77), Research Triangle Park, N.C. 27711, EPA-600/9-76-005 (January 1976).

2. Environmental Monitoring and Support laboratory, "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II—Ambient Air Specific Methods," U.S. Environmental Protection Agency (MD-77), Research Triangle Park, N.C. 27711, EPA-600/4-77-027a (May 1977).

Table 3.3.1 - Data Assessment Report for PSD Air Quality Data - Part I

Organization Name Acme Power Plant
Organization Address Route 54, Apex, N.C. 27502
Reporting Period: From 5/15/78 (month/day/year) to 8/15/78 (month/day/year)

Continuous Analyzers (CO, NO_2, O_3, SO_2) or Integrated Samplers (TSP)

Pollutant	Analyzer Identification Code	Precision			Accuracy		
		No. of Span Checks or Collocated Samples	95% Limit*		Audit Date	95% Limit*	
			Lower	Upper		Lower	Upper
CO	Site 2	13	-6	+6			
NO_2	Site 2				7/11/78	+3	+5
TSP	Site 2	12	-2	+7	6/13/78	+1	+10

*show + or - sign with limit value

Table 3.3.1 - Data Assessment Report for PSD Air Quality Data - Part II

Organization Name Acme Power Plant
Organization Address Route 54, Apex, N.C. 27502
Reporting Period: From 5/15/78 (month/day/year) to 8/15/78 (month/day/year)

Audit Results for Continuous Analyzers (CO, NO_2, O_3, SO_2)

Pollutant	Analyzer Identification Code	Concentration, ppm									
		Point 1		Point 2		Point 3		Point 4		Point 5	
		Known	Diff.*	Known	Diff.*	Known	Diff.*	Known	Diff.*	Known	Diff.*
NO_2	Site 2	.051	+.002	.102	.005	.204	+.008	.307	+.014	.460	+.020

*Calculate audit difference using the equation below. Show + or - sign when recording difference.
Diff. = measured conc.$_{ppm}$ - known conc.$_{ppm}$

APPENDIX C—AMBIENT AIR QUALITY MONITORING METHODOLOGY

1.0 PURPOSE

This appendix specifies the monitoring methods (manual methods or automated analyzers) which must be used in State ambient air quality monitoring stations.

2.0 STATE AND LOCAL AIR MONITORING STATIONS (SLAMS)

2.1 Except as otherwise provided in this appendix, a monitoring method used in a SLAMS must be a reference or equivalent method as defined in § 50.1 of this chapter.

2.2 Any analyzer for SO_2, CO, or O_3 purchased before February 18, 1976, may be used in a SLAMS until February 18, 1980. Any analyzer for NO_2 purchased before January 3, 1978, may be used in a SLAMS until January 3, 1980.

2.3 Any manual method or analyzer purchased prior to cancellation of its reference or equivalent method designation under § 53.11 or § 53.16 of this chapter may be used in a SLAMS for a reasonable period of time to be determined by the Administrator.

2.4 Use of nonconforming analyzers in certain geographical areas.

2.4.1 The State may use an analyzer that is not a reference or equivalent method in a SLAMS in a particular geographical area if the analyzer was purchased prior to February 18, 1975, and the Administrator determines:

2.4.1.1 That the analyzer (or the method of which the analyzer is representative) meets all the requirements of part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative except: (A) The test for interference equivalent specified in § 53.23(d) of this chapter, and (B) requirements of subpart C of part 53 of this chapter, if applicable, to the extent that failure to meet the subpart C requirements results from sensitivity to interferants; and

2.4.1.2 That interferants that cause or would cause the analyzer to fail the requirements of § 53.23(d) and subpart C of part 53 of this chapter do not occur in significant concentrations in the geographical area in which use of the analyzer is proposed. For purposes of this section (2.4), a "significant concentration" means one that would cause a measurement error equal to or greater than the lower detectable limit specification in table B-1 in subpart B of part 53 of this chapter.

2.4.2 Requests for approval under this section (2.4) must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each such request must contain the information specified in subsection 2.7.2 in addition to the following:

2.4.2.1 The date on which the analyzer was purchased;

2.4.2.2 An identification and description of the geographical area in which use of the analyzer is proposed;

2.4.2.3 Such data or other information as may be necessary to demonstrate that the interferants referred to in subsection 2.4.1.2 do not occur in significant concentrations in the geographical area in which use of the analyzer is proposed; and

2.4.2.4 Test data for tests conducted with the analyzer in accordance with subpart C of part 53 of this chapter in the geographical area in which use of the analyzer is proposed, if subpart C would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative.

2.4.3 Any person who has obtained approval of a request under this section (2.4) shall:

2.4.3.1 Assure that the analyzer for which approval was obtained is used only in the geographical area identified in the request;

2.4.3.2 Report to the Administrator within 60 days any significant increase in concentrations of the interferants referred to in subsection 2.4.1.2 in the geographical area identified in the request and concurrently submit such new or additional information as may be necessary to supplement the demonstration required by subsection 2.4.2.3; and

2.4.3.3 On a semi-annual basis, submit reports containing such data or other information as may be necessary to demonstrate that the interferants referred to in subsection 2.4.1.2 continue to occur in insignificant concentrations in the geographical area identified in the request. Reports required by this subsection (2.4.3) shall be submitted to the address specified in subsection 2.7.1.

2.5 Use of methods with nonconforming ranges.

2.5.1 The State may use in a SLAMS an analyzer that is not a reference or equivalent method if:

2.5.1.1 The analyzer was purchased prior to February 18, 1975;

2.5.1.2 The administrator determines that the analyzer (or the method of which the analyzer is representative) meets all requirements of part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative except the range requirement specified in table B-1 in subpart B of part 53 of this chapter; and

2.5.1.3 The range of the analyzer does not extend to concentrations more than two times the upper range limit specified in such table B-1, or, if the analyzer has more than one selectable range, the analyzer will not be used while operated in any range extending to such concentrations.

NOTE.—If the use of the analyzer is approved under section 2.6, the limitations specified in this subsection (2.5.1.3) will not apply unless the approval under section 2.6 is later withdrawn.

2.5.2 Requests for approval under this section (2.5) must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each such request must contain the information specified in subsection 2.7.2 in addition to the following:

2.5.2.1 The date on which the analyzer was purchased; and

2.5.2.2 A statement that the range of the analyzer does not extend to concentrations more than two times the upper range limit specified in table B-1 in subpart B of part 53 of this chapter, or, if the analyzer has more than one selectable range, that the analyzer will not be operated in any range extending to such concentrations.

NOTE.—If use of the analyzer is approved under section 2.6, the statements required by this subsection (2.5.2.2) will be considered inapplicable unless the approval under section 2.6 is later withdrawn.

2.5.3 Any person who has obtained approval of a request under this section (2.5) shall, if the analyzer has more than one selectable range, assure that the analyzer is not operated in any range extending to concentrations more than two times the upper range limit specified in such table B-1.

2.6 Use of methods with nonconforming ranges in certain geographical areas.

2.6.1 The State may use in a SLAMS an analyzer which is not a reference or equivalent method but which has a broader range (i.e., one extending to higher concentrations) than that permitted by section 2.5 regardless of the date on which the analyzer was purchased if:

2.6.1.1 The analyzer has more than one selectable range and one of the ranges is either the range specified in table B-1 in subpart B of part 53 of this chapter or a range approved for use under section 2.5 (which applies to analyzers purchased before February 18, 1975);

2.6.1.2 The Administrator determines that the analyzer (or the method of which the analyzer is representative) meets all the requirements of part 53 of this chapter that would apply if an application for a reference or equivalent method determination were submitted for the method of which the analyzer is representative, except that subsection 2.6.1.1 will apply in lieu of the range requirements specified in table B-1;

2.6.1.3 The pollutant intended to be measured with the analyzer occurs on some occasions in concentrations more than two times the upper range limit specified in table B-1 of subpart B in part 53 of this chapter in the geographical area in which use of the analyzer is proposed; and

2.6.1.4 The Administrator determines that the resolution of each proposed range that is broader than that permitted by section 2.5 is adequate for its intended use. For purposes of this section (2.6), "resolution" means the ability of the analyzer to detect small changes in concentration.

2.6.2 Requests for approval under this section (2.6) must meet the submittal requirements of section 2.7. Except as provided in subsection 2.7.3, each such request must contain the information specified in subsection 2.7.2 in addition to the following:

2.6.2.1 The range or ranges proposed to be used;

2.6.2.2 Test data, records, calculations, and test results as specified in subsection 2.7.2.2 for each range proposed to be used;

2.6.2.3 An identification and description of the geographical area in which use of the analyzer is proposed;

2.6.2.4 Data or other information demonstrating that the pollutant intended to be measured with the analyzer occurs in concentrations more than two times the upper range limit specified in table B-1 in subpart B of part 53 of this chapter in the geographical area in which use of the analyzer is proposed; and

2.6.2.5 Test data or other information demonstrating the resolution of each proposed range that is broader than that permitted by section 2.5.

2.6.3 Any person who has obtained approval of a request under this section (2.6) shall assure that the analyzer for which approval was obtained is used only in the geographical area identified in the request and only while operated in the range or ranges specified in the request.

2.7 Requests for approval; withdrawal of approval.

2.7.1 Requests for approval under sections 2.4, 2.5, or 2.6 must be submitted to:

Director, Environmental Monitoring and Support Laboratory, Department E (MD 75), United States Environmental Protection Agency, Environmental Research Center, Research Triangle Park, N.C. 27711.

2.7.2 Except as provided in subsection 2.7.3, each request must contain:

2.7.2.1 A statement identifying the analyzer (e.g., by serial number) and the method of which the analyzer is representative (e.g., by manufacturer and model number); and

2.7.2.2 Test data, records, calculations, and test results for the analyzer (or the method of which the analyzer is representative) as specified in subpart B, subpart C, or both (as applicable) of part 53 of this chapter.

2.7.3 A request may concern more than one analyzer or geographical area and may incorporate by reference any data or other information known to EPA from one or more of the following:

2.7.3.1 An application for a reference or equivalent method determination submitted to the Environmental Protection Agency (EPA) for the method of which the analyzer is representative, or testing conducted by the applicant or by EPA in connection with such an application;

2.7.3.2 Testing of the method of which the analyzer is representative at the initiative of the Administrator under § 53.7 of this chapter; or

2.7.3.3 A previous or concurrent request for approval submitted to EPA under this section (2.7).

2.7.4 To the extent that such incorporation by reference provides data or information required by this section (2.7) or by sections 2.4, 2.5, or 2.6, independent data or duplicative information need not be submitted.

2.7.5 After receiving a request under this section (2.7), the Administrator may request such additional testing or information or conduct such tests as may be necessary in his judgment for a decision on the request.

2.7.6 If the Administrator determines, on the basis of any information available to him, that any of the determinations or statements on which approval of a request under this section (2.7) was based are invalid or no longer valid, or that the requirements of section 2.4, 2.5, or 2.6, as applicable, have not been met, he may withdraw the approval after affording the person who obtained the approval an opportunity to submit information and arguments opposing such action.

2.8 Modifications of methods by users.

2.8.1 Except as otherwise provided in this section (2.8), no reference method, equivalent method, or alternative method may be used in a SLAMS if it has been modified in a manner that will, or might, significantly alter the performance characteristics of the method without prior approval by the Administrator. For purposes of this section (2.8), "alternative method" means an analyzer the use of which has been approved under sections 2.4, 2.5, or 2.6 or this appendix or some combination thereof.

2.8.2 Requests for approval under this section (2.8) must meet the submittal requirements of sections 2.7.1 and 2.7.2.1 of this appendix.

2.8.3 Each request submitted under this section (2.8) must include:

2.8.3.1 A description, in such detail as may be appropriate, of the desired modification;

2.8.3.2 A brief statement of the purpose(s) of the modification, including any reasons for considering it necessary or advantageous;

2.8.3.3 A brief statement of belief concerning the extent to which the modification will or may affect the performance characteristics of the method; and

2.8.3.4 Such further information as may be necessary to explain and support the statements required by subsections 2.8.3.2 and 2.8.3.3.

2.8.4 Within 75 days after receiving a request for approval under this section (2.8) and such further information as he may request for purposes of his decision, the Administrator will approve or disapprove the modification in question by letter to the person or agency requesting such approval.

2.8.5 A temporary modification that will or might alter the performance characteristics of a reference, equivalent, or alternative method may be made without prior approval under this section (2.8) if the method is not functioning or is malfunctioning, *Provided*, That parts necessary for repair in accordance with the applicable operation manual cannot be obtained within 45 days. Unless such temporary modification is later approved under subsection 2.8.4, the temporarily modified method shall be repaired in accordance with the applicable operation manual as quickly as practicable but in no event later than 4 months after the temporary modification was made, unless an extension of time is granted by the Administrator. Unless and until the temporary modification is approved, air quality data obtained with the method as temporarily modified must be clearly identified as such when submitted in accordance with § 58.28 or § 58.35 of this chapter and must be accompanied by a report containing the information specified in subsection 2.8.3. A request that the Administrator approve a temporary modification may be submitted in accordance with subsections 2.8.1 through 2.8.4. In such cases the request will be considered as if a request for prior approval had been made.

3.0 NATIONAL AIR MONITORING STATIONS (NAMS)

3.1 Methods used in those SLAMS which are also designated as NAMS to measure SO_2, CO, NO_2, or O_3, must be reference or equivalent methods which have the capability of providing continuous measurements.

4.0 AIR POLLUTION EPISODE MONITORING

4.1 An analyzer which has been designated a reference or equivalent method on one of its ranges for measuring either SO_2, O_3, NO_2, or CO may be used in a SLAMS to measure the appropriate pollutant while operating on a range which is not covered by the analyzer's designation if:

4.1.1 The nondesignated range does not exceed three times the upper range limit specified in table B-1 of part 53 of this chapter;

4.1.2 An air pollution episode, during which the nondesignated range is needed for accurate monitoring, exists or is imminent; and

4.1.3 The quality assurance requirements of section 1.1.3 of appendix A to this part are met.

4.2 A monitoring method used to measure particulate matter in a station designated as an air pollution episode station under § 58.20(c) of this chapter must be a method:

4.2.1 Which has the measurement range or ranges appropriate to accurately measure air pollution episode concentrations of particulate matter;

4.2.2 For which a quantitative relationship to the particulate matter reference method has been established at the use site; and

4.2.3 Which has an integration period appropriate for short term daily measurements.

APPENDIX D—NETWORK DESIGN FOR STATE AND LOCAL AIR MONITORING STATIONS (SLAMS) AND NATIONAL AIR MONITORING STATIONS (NAMS)

1. SLAMS monitoring objectives and spatial scales.
2. SLAMS site selection procedures.
2.1 Background information for establishing SLAMS.
2.2 Total suspended particulates (TSP) design criteria for SLAMS.
2.3 Sulfur dioxide (SO_2) design criteria for SLAMS.
2.4 Carbon monoxide (CO) design criteria for SLAMS.
2.5 Photochemical oxidants (O_3) design criteria for SLAMS.
2.6 Nitrogen dioxide (NO_2) design criteria for SLAMS.
3. Network design for national air monitoring stations (NAMS).
3.1 Total suspended particulates (TSP) design criteria for NAMS.
3.2 Sulfur dioxide (SO_2) design criteria for NAMS.
3.3 Carbon monoxide (CO) design criteria for NAMS.
3.4 Photochemical oxidants (O_3) design criteria for NAMS.
3.5 Nitrogen dioxide (NO_2) design criteria for NAMS.
4. References.

1. SLAMS MONITORING OBJECTIVES AND SPATIAL SCALES

The purpose of this document is to describe monitoring objectives and general criteria to be applied in establishing the State and local air monitoring stations (SLAMS) networks and for choosing general locations for new monitoring stations. It also describes criteria for determining the number and location of national air monitoring stations (NAMS). These criteria will also be used by EPA in evaluating the adequacy of SLAMS/NAMS networks.

The network of stations which comprise SLAMS should be designed to meet a minimum of four basic monitoring objectives. These basic monitoring objectives are: (1) To determine highest concentrations expected to occur in the area covered by the network; (2) to determine representative concentrations in areas of high population density; (3) to determine the impact on ambient pollution levels of significant sources or source categories; and (4) to determine general background concentration levels.

To a large extent, the existing State implementation plan (SIP) monitoring networks have been designed with these four objectives in mind. Thus, they can serve as the logical starting point for establishing the SLAMS network. This will, however, require a careful review of each existing SIP ambient network to determine the principal objectives of each station and the extent to which the location criteria presented herein are being met. It should be noted that this appendix contains no criteria for determin-

ing the total number of stations in SLAMS networks. The optimum size of a particular SLAMS network involves trade offs among data needs and available resources which EPA believes can best be resolved during the network design process.

This appendix focuses on the relationship between monitoring objectives and the geographical location of monitoring stations. Included are a rationale and set of general criteria for identifying candidate station locations in terms of physical characteristics which most closely match a specific monitoring objective. The criteria for more specifically locating the monitoring station including spacing from roadways and vertical and horizontal probe placement, are described in appendix E of this part.

To clarify the nature of the link between general monitoring objectives and the physical location of a particular monitoring station, the concept of spatial scale of representativeness of a monitoring station is defined. The goal in siting monitors is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring objective of the station.

Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring station throughout which actual pollutant concentrations are reasonably similar. The scale of representativeness of most interest for the monitoring objectives defined above are as follows:

- *Microscale*—defines the concentrations in air volumes with dimensions ranging from meters up to about 100 meters.
- *Middle scale*—defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometers.
- *Neighborhood scale*—defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometer range.
- *Urban scale*—defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.
- *Regional scale*—defines usually a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers.
- *National and global scales*—these measurement scales represent concentrations characterizing the nation and the globe as a whole.

This concept is also useful in classification of monitoring stations into categories which best describe the ambient conditions represented by a particular station. For example, a station selected to monitor the highest concentration expected to occur within a defined area can be further described in terms of its actual spatial scale of representativeness. For this objective, the most appropriate scale is the middle scale or neighborhood, depending somewhat on the particular pollutant being monitored and the particular use for the data.

The concept can be illustrated by extending this example to consider the pollutant CO. Generally, highest concentrations of CO occur near heavily traveled roadways in downtown areas. Concentrations which occur in this kind of physical environment typically peak nearest the roadway and decrease rapidly as the monitor is moved away from the roadway. Thus, a station monitoring CO near a busy street over a sidewalk would be classified as a middle scale station designed to measure the highest concentrations expected to occur in the affected urban area. Table 1 illustrates the relationship between the four basic monitoring objectives and the scales of representativeness that are generally most appropriate for that objective.

TABLE 1.—*Relationship among monitoring objectives and scale of representativeness*

Monitoring objective	Appropriate siting scales
Highest concentration	Middle, neighborhood (sometimes urban).
Population	Neighborhood.
Source impact	Middle, neighborhood.
General/background	Neighborhood, regional.

Subsequent sections of this appendix describe in greater detail the most appropriate scales of representativeness and general monitoring locations for each of the criteria pollutants.

2. SLAMS SITE SELECTION PROCEDURES

The preceding section of this appendix has stressed the importance of defining the objectives for monitoring a particular pollutant. Since monitoring data are collected to "represent" the conditions in a part or subregion of a geographical area, the guidance included a discussion of the scale of representativeness of a monitoring station. The use of this physical basis for locating stations allows for an objective approach to station siting.

In order to evaluate the SIP network and to determine the adequacy of a particular monitoring stations, it is necessary to examine each pollutant monitoring station individually by stating its monitoring objective and determining its spatial scale of representativeness. This will do more than insure compatibility among stations of the same type. It will also provide a physical basis for the interpretation and application of the data. This will help to prevent mismatches between what the data actually represent and what the data are interpreted to represent. It is important to note that SLAMS monitors are not necessarily sufficient for completely describing air quality. In many situations, diffusion models must be applied to complement ambient monitoring, particularly around point sources.

2.1 Background information for establishing SLAMS. Background information that must be considered in the process of selecting SLAMS from the existing network and in establishing new SLAMS includes emission inventories, climatological summaries, and local geographical characteristics. Such information is to be used as a basis for the judgmental decisions that are required during the station selection process. For new sites, the background information should be used to decide on the actual location depending on the monitoring objective and spatial scale while following the detailed procedures in References (*1*) through (*4*).

Emission inventories are generally the most important type of background information needed to design the SLAMS network. The emission data provide valuable information concerning the size and distribution of large point sources. Area source emissions are usually available for counties but should be subdivided into smaller areas or grids where possible, especially if diffusion modeling is to be used as a basis for determining where stations should be located. Sometimes this must be done rather crudely—for example, on the basis of population or housing units. In general, the grids should be smaller in areas of dense population than in less densely populated regions.

Emission inventory information for point sources should be generally available for any area of the country for annual and seasonal averaging times. Specific information characterizing the emissions from large point sources for the shorter averaging times (diurnal variations, load curves, etc.) can often be obtained from the source. Area source emission data by season, although not available from the EPA, can be generated by apportioning annual totals according to degree days.

Detailed area source data are also valuable in evaluating the adequacy of existing sites in terms of whether the site has been located in the desired spatial scale of representativeness. For example, it may be the desire of an agency to have an existing CO site measuring in the neighborhood scale. By examining the traffic data for the area and examining the physical location of the site, a determination can be made if the site is in fact measuring air quality on the desired scale.

The climatological summaries of greatest use are the frequency distributions of wind speed and direction. The wind rose is an easily interpreted graphical presentation of the directional frequencies. Other types of useful climatological data are also available, but generally are not as directly applicable to the site selection process as are the wind statistics.

In many cases, the meteorological data originating from the most appropriate (not necessarily the nearest) national weather service (NWS) airport station in the vicinity of the prospective siting area will adequately reflect conditions over the area of interest, at least for annual and seasonal averaging times. In developing data in complex meteorological and terrain situations, diffusion meteorologists should be consulted. NWS stations can usually provide most of the relevant weather information in support of monitor siting activities anywhere in the country. Such information includes joint frequency distributions of winds and atmospheric stability (stability-wind roses).

The geographical material is used to determine the distribution of natural features, such as forests, rivers, lakes, and manmade features. Useful sources of such information may include road and topographical maps, aerial photographs, and even satellite photographs. This information may include the terrain and land-use setting of the prospective monitor siting area, the proximity of larger water bodies, the distribution of pollutant sources in the area, the location of NWS airport stations from which weather data may be obtained, etc. Land use and topographical characteristics of specific areas of interest can be determined from U.S. Geological Survey (USGS) maps and land use maps. Detailed information on urban physiography (building/street dimensions, etc.) can be obtained by visual observations, aerial photography, and also surveys to supplement that available from those sources. Such information could be used in determining the location of local pollutant sources in and around the prospective areas.

2.2 Total suspended particulates (TSP) design criteria for SLAMS. The first step in designing the TSP SLAMS network is to collect the necessary background information as discussed previously. For TSP monitoring purposes, emphasis on background information would be placed on regional and traffic maps and aerial photographs showing topography, settlements, major industries, and highways. These maps and photographs would be used to identify areas of the type that are of concern to the particular monitoring objective. After potentially suitable monitoring areas for TSP have been identified on a map, a model(*5*) may be used to provide an estimate of TSP concentrations throughout the area of interest.

The second step is to evaluate existing TSP stations which are candidates for SLAMS designation. Stations meeting one or more of the four monitoring objectives (section 2) must be classified into one of three scales of representativeness—middle, neighborhod or regional—if the stations are to become SLAMS. In siting and classifying new TSP sites, the procedures described in reference(*1*) must be used.

The following describes in detail the characteristics of the three scales revelant to TSP SLAMS. These scales are most appropriate because of the dominant importance attached to the monitoring purposes that are related to the NAAQS. Most people are exposed to TSP, at least over 24-hour periods, on a neighborhood scale and to a lesser extent on a middle scale.

● *Middle scale*—Much of the measurement of short-term public exposure to particulates is on this scale. People moving through downtown areas, or living near major roadways, encounter particulates that would be adequately characterized by observations of this spatial scale. Thus, measurements of this type would be appropriate to the evaluation of the possible short-term public health effects of particulate pollution. This scale also includes the characteristic concentrations for other areas with dimensions of a few hundred meters such as the parking lot and feeder streets associated with indirect sources, that is complexes that do not produce pollutants themselves but which attract significant numbers of pollutant producers such as autos. Shopping centers, stadiums, and office buildings are examples of indirect sources. In the case of TSP, unpaved or seldom-swept parking lots associated with such attractions could be an important source in addition to the vehicular emissions themselves.

● *Neighborhood scale*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban subregion with dimensions of a few kilometers and generally more regularly shaped than the middle scale. Homogeneity refers to the TSP concentration, as well as the land use and land surface characteristics. In some cases, a site carefully chosen to provide neighborhood scale data would represent not only the immediate neighborhood but also neighborhoods of the same type in other parts of the city. Stations of these kinds provide good information about trends and compliance with standards because they represent conditions in areas where people commonly live and work for periods comparable to those specified in the NAAQS. In the sense used here, this category includes industrial and commercial neighborhoods, as well as residential.

Neighborhood scale data could provide valuable information for developing, testing and revising models that describe the larger-scale concentration patterns, especially those models relying on spatially smoothed emission fields for inputs. The neighborhood scale measurements could also be used for neighborhood comparisons within or between cities. This is the most likely scale of measurement to meet the needs of planners.

● *Regional scale*—These measurements would characterize conditions over areas with dimensions of as much as hundreds of kilometers. As noted earlier, using representative conditons for an area implies some degree of homogeneity in that area. For this reason, regional scale measurements would be most applicable to sparsely populated areas with reasonably uniform ground cover, at least as it relates to surface dust entrainment. Data characteristics of this scale would provide information about larger-scale processes of particulate emissions, losses and transport.

2.3 Sulfur dioxide (SO_2) design criteria for SLAMS. The spatial scales for SO_2 SLAMS monitoring are the middle, neighborhod, and regional scales. Because of the nature of SO_2 distributions over urban areas, the middle scale is the most likely scale to be represented by a single measurement in an urban area, but only if the undue effects from local sources (minor or major point sources) can be eliminated. Neighborhood scales would be those most likly to be represented by single measurements in suburban areas where the concentration gradients are less steep. Regional scale measurements would be associated with rural areas.

● *Middle scale*—Some data uses associated with middle scale measurements for SO_2 include assessing the effects of control strategies to reduce urban concentrations (especially for the 3-hour and 24-hour averaging times) and monitoring air pollution episodes.

● *Neighborhood scale*—This scale applies in areas where the SO_2 concentration gradient is relatively flat—mainly suburban areas surrounding the urban center—or in large sections of small cities and towns. In general, these areas are quite homogeneous in terms of SO_2 emission rates and population density. Neighborhood scale measurements may be associated with baseline concentrations in areas of projected growth and in studies of population responses to exposure to SO_2 (or health effects). Also, concentration maxima associated with air pollution episodes may be reasonably uniformly distributed over areas of neighborhood scale, and measurements taken within such an area would represent neighborhood, as well as middle scale concentrations.

● *Regional scale*—These measurements would be applicable to large homogeneous areas, particularly those which are sparsely populated. Such measurements could provide information on background air quality and interregional pollutant transport.

After the spatial scale has been selected to meet the monitoring objectives for each station location, the procedures as found in reference (*2*) should be used to evaluate the adequacy of each existing SO_2 monitor and must be used to locate a new SLAMS monitor. The background material for these procedures should consist of emission inventories, meteorological data, wind roses, and maps for population and topographical characteristics of specific areas of interest. Isopleth maps of SO_2 air quality as generated by diffusion models (*5*) are useful for the general determination of a prospective area within which the station is eventually placed.

2.4 Carbon monoxide (CO) design criteria for SLAMS. Middle and neighborhood scale measurements are necessary station classifications for SLAMS since most people are exposed to CO concentrations in these scales. Carbon monoxide maxima occur primarily in areas near major roadways and intersections with high traffic density and poor atmospheric ventilation. As these maxima can be predicted by ambient air quality modeling, a large fixed network of CO monitors is not required. Long-term CO monitoring should be confined to a limited number of "peak" neighborhood and middle scale sites in large metropolitan areas to measure maximum pollution levels and determine the effectiveness of control strategies.

● *Middle scale*—This category covers dimensions from tens of meters to hundreds of meters. In certain cases discussed below, it may apply to regions that have a total length of kilometers. In many cases of interest, sources and land use may be reasonably homogeneous for long distances along a street, but very inhomogeneous normal to the street. This is the case with strip development and freeway corridors. Included in this category are measurements to characterize the CO concentrations along the urban features just enumerated. When a site is chosen to represent conditions in a freeway corridor or a block of street development, then the characteristic dimensions of this scale are tens of meters by hundreds of meters. If an attempt is made to characterize street conditions throughout the downtown area or along an extended stretch of freeway, the dimensions may be tens of meters by kilometer. Public officials who use air quality standards related to public health effects would use measurements of this scale for their assessment. People moving through city streets tend to be exposed to CO concentrations consistent with a scale like this. This is also a scale of measurement that would provide valuable information for air pollution alerts, for devising and evaluating "hot spot" control measures, and for comparing central business districts in different cities.

This important class would also include the characteristic concentrations for other areas, with dimensions of a few hundred meters, such as the parking lots and feeder streets associated with indirect sources—that is, complexes that are not themselves pollutant emitters, but which attract significant numbers of pollutant emitters, particularly autos. Shopping centers, stadia, and office buildings are examples of indirect sources.

● *Neighborhood scale*—Measurements in this category would represent conditions throughout some reasonably homogeneous urban subregions, with dimensions of a few kilometers and generally more regularly shaped than the middle scale. Homogeneity refers to CO concentration, but it probably also applies to land use. In some cases, a site carefully chosen to provide neighborhood scale data, might represent not only the immediate neighborhood, but also neighborhoods of the same type of other parts of the city. These kinds of stations would provide information relating to health effects because they would represent conditions in

areas where people live and work. Neighborhood scale data would provide valuable information for developing, testing, and revising concepts and models that describe the larger scale concentration patterns, especially those models relying on spatially smoothed emission fields for inputs. These types of measurements could also be used for interneighborhood comparisons within, or between cities.

After the spatial scale has been determined to meet the monitoring objectives for each location, the site selection procedures, as shown in reference (*3*) should be used to evaluate the adequacy of each existing CO monitor and must be used to locate a new monitor. The background material necessary for these procedures may include the average daily traffic on all streets in the area; wind roses for different hours of the day; and maps showing one-way streets, street widths, and building heights. If the station is to typify the area with the highest concentrations, the streets with the greatest daily traffic should be identified. If some streets are one-way, those streets that have the greatest traffic during the afternoon and evening hours should be selected as tentative sites, because the periods of high traffic volume are usually of greatest duration through the evening hours. However, the strength of the morning inversion has to be considered along with the traffic volume and pattern when seeking areas with the highest CO concentrations.

Monitors should not be placed in the vicinity of possible anomalous source areas. Examples of such areas include toll gates on turnpikes, metered freeway ramps, and drawbridge approaches. Traffic counters near the monitoring site will provide valuable data for interpreting the observed CO concentrations. Additional information on siting procedures may be found in reference (*3*).

2.5 Photochemical oxidant (O_3) design criteria for SLAMS. Photochemical oxidants are not directly emitted into the atmosphere but result from complex photochemical reactions involving organic compounds, oxides of nitrogen and solar radiation. Oxidants are defined as those atmospheric substances that will oxidize specified reagents such as potassium iodide. The most abundant oxidant is ozone (O_3). For this reason, the term oxidant and ozone are often used interchangeably.

The relationships between primary emissions (precursors) and secondary pollutants (O_3) tend to produce large separations spatially and temporally between the major sources and the areas of high oxidant pollution. This suggests that meteorological transport process and the relationships between sources and sinks need to be considered in the development of the network design criteria and placement of monitoring stations, especially in measuring peak concentration levels.

The spatial scales for SLAMS purposes based on the monitoring objectives are neighborhood, urban, and regional. The neighborhood scale monitors will be needed to measure the high oxidant concentrations associated with significant population exposure within the urban area. Under stagnation conditions, a station located in the neighborhood scale may also experience peak concentration levels in urban areas.

The urban scale stations would be used to measure peak concentrations downwind of precursor emissions. Since ozone requires appreciable formation time, the mixing of reactants and products occurs over large volumes of air, and this reduces the importance of monitoring small scale spatial variability.

Regional scale monitoring will be needed to assess the ozone that is transported into an urban area. This will be used to account for the ozone that cannot be reduced by control strategies in that urban area.

● *Neighborhood scale*—Measurements in this category represent conditions throughout some reasonably homogeneous urban subregion, with dimensions of a few kilometers. Homogeneity refers to pollutant concentrations. These kinds of monitoring stations will provide information relating to health effects because they will also represent conditions in areas where people live and work. Neighborhood scale data will provide valuable information for developing, testing, and revising concepts and models that describe urban/regional concentration patterns. They will be useful to the understanding and definition of processes that take periods of hours to occur and hence involve considerable mixing and transport.

● *Urban scale*—Measurement in this scale will be used to estimate concentrations over large portions of an urban area with dimensions of several kilometers to 50 or more kilometers. Such measurements will be used for determining trends, and designing area-wide control strategies.

● *Regional scale*—This scale of measurement will be used to typify concentrations over very large portions of a metropolitan area and even larger areas with dimensions of as much as hundreds of kilometers. Such measurements will be useful for assessing transport into the urban area.

The site selection procedure continues after the spatial scale is selected based on the monitoring objectives. The appropriate siting procedures as found in reference (*4*), should be used to evaluate the adequacy of each existing O_3 monitor and must be used to locate a new O_3 SLAMS monitor. The first step in the siting procedure would be to collect the necessary background material, which may consist of maps, emissions inventories for nonmethane hydrocarbons and oxides of nitrogen (NO_x), climatological data, and existing air quality data for ozone, nonmethane hydrocarbons and NO_x/NO.

For locating an urban scale station to measure typical city concentrations, a reasonably homogeneous geographical area near the center of the region should be selected which is also removed from the influence of major NO_x sources. For an urban scale station to measure the high concentration areas, the emission inventories should be used to define the extent of the area of important nonmethane hydrobcarbons and NO_x emissions. The most frequent wind speed and direction for periods of important photochemical activity should be determined. Then the prospective monitoring area should be selected in a direction from the city that is most frequently downwind during periods of photochemical activity. The distance to the upwind edge of the city should be about equal to the distance traveled by air moving for 5 to 7 hours at wind speeds prevailing during periods of photochemical activity. Prospective areas for locating O_3 monitors should always be outside the area of major NO_x.

In locating a neighborhood scale station, the same procedures used for the urban scale are followed except that the station should be located closer to the fringe of the Central Business District (CBD) or slightly further downwind of the CBD in an area of high density population.

For regional scale monitoring stations, the most frequent wind associated with important photochemical activity should be determined. The prospective monitoring area should be upwind for the most frequent direction and outside the area of city influence.

Where ozone levels have significant fluctuations throughout the year, consideration should be given to monitoring ozone only during the seasons when levels above the NAAQS occur as documented by previous data. Additional discussion on the procedures for siting ozone monitors may be found in reference (*4*).

2.6 Nitrogen dioxide (NO_2) design criteria for SLAMS. The typical spatial scales of representativeness associated with nitrogen dioxide monitoring based on monitoring objectives are middle, neighborhood, and urban. Since nitrogen dioxide is primarily formed in the atmosphere from the oxidation of NO, large volumes of air and mixing times usually reduce the importance of monitoring on small scale spatial variability especially for long averaging times. However, there may be some situations where NO_2 measurements would be made on the middle scale for both long- and short-term averages.

● *Middle scale*— Measurements on this scale would cover dimensions from about 100 meters to 0.5 kilometers. These measurements would characterize the public exposure to NO_2 in populated areas. Also monitors that are located closer to roadways than the minimum distances as specified in appendix E of this part, would be represented by measurements on this scale.

● *Neighborhood and urban scales*—The same considerations as discussed in § 2.5 for O_3 would also apply to NO_2.

After the spatial scale is selected based on the monitoring objectives, then the siting procedures as found in reference (*4*) should be used to evaluate the adequacy of each existing NO_2 monitor and/or to locate a new NO_2 monitor. The siting procedures begin with collecting the background material. This background information may include the characteristics of the area and its sources under study, climatological data to determine where concentration maxima are most likely to be found, and any existing monitoring data for NO_2.

For neighborhood or urban scales, the emphasis in locating sites will be in finding those areas where long-term averages are expected to be the highest. Nevertheless, it should be expected that the maximum NO_2 concentrations will occur in approximately the same locations as the maximum total oxides of nitrogen concentrations. The best course would be to locate the site somewhat further downwind beyond the expected point of maximum total oxides of nitrogen to allow more time for the formation of NO_2. The dilution of the emissions further downwind from the sources should be considered along with the need for reaction time for NO_2 formation in locating peak concentration sites. If dispersion is favorable, maximum concentrations may occur closer to the emission sources than the locations predicted from oxidation of NO to NO_2 alone. This will occur downwind of sources based on winter wind direction or in areas where there are high ozone concentrations

and high density NO_x emissions such as on the fringe of the central business district or further downwind. The distance and direction downwind would be based on ozone season wind patterns.

Once the major emissions areas and wind patterns are known, areas of potential maximum NO_x levels can be determined. Nitrogen dioxide concentrations are likely to decline rather rapidly outside the urban area. Therefore, the best location for measuring NO_x concentrations will be in neighborhoods near the edge of the city.

3. NETWORK DESIGN FOR NATIONAL AIR MONITORING STATIONS (NAMS)

The NAMS must consist of a subset of the SLAMS network with emphasis given to urban and multisource areas. Areas to be monitored must be selected based on urbanized population and pollutant concentration levels. Generally, a larger number of NAMS are needed in more polluted urban and multisource areas. The network design criteria discussed below reflect these concepts. However, it should be emphasized that deviations from the NAMS network design criteria may be necessary in a few cases. Thus, these design criteria are not a set of rigid rules but rather a guide for achieving a proper distribution of monitoring sites on a national scale.

The two primary objectives for NAMS are to measure highest concentrations for averaging times consistent with the NAAQS and population exposure. Accordingly, the NAMS fall into two categories: (a) Stations located in the area of the peak or maximum concentrations (generally neighborhood scale, except middle scale for CO and urban scale for O_3); and (b) stations which combine poor air quality with a high population density but not necessarily located in an area of the worst air quality (neighborhood scale). The highest or peak concentration stations referred to here means stations located in the area of expected maximum pollutant concentration. Such peak concentration stations are to be located so that impacts from individual point sources are minimized.

For each urban area where NAMS are required, both categories of monitoring stations must be established. In the case of TSP and SO_2 where only one NAMS is needed, then category (a) must be used. The analysis and interpretation of data from these stations should consider the distinction between these types of stations as appropriate.

The NAMS are designed to provide data for national policy analyses/trends and for reporting to the public on major metropolitan areas. It is not the intent to monitor in every area where the NAAQS are violated. On the other hand, the data from SLAMS should be used primarily for nonattainment decisions/analyses in specific geographical areas. Since the NAMS are a part of the SLAMS, the specific siting procdeures will not be repeated in this section.

3.1 Total suspended particulates (TSP) design criteria for NAMS. Table 2 indicates the approximate number of permanent monitors needed in urban areas to characterize national and regional TSP air quality trends and geographical patterns. The criteria require that the number of stations in areas where urban populations exceed 500,000 and concentrations violate the primary NAAQS range from 6 to 8 but in small urban areas, no more than two stations are required. A range of monitoring stations is specified in table 2 because sources of pollutants and local control effects can vary from one part of the country to another and therefore, some flexibility is allowed in selecting the actual number of stations in any one locale. The actual number of stations and their location must be determined by EPA Regional Offices and the State agency, subject to the approval of EPA Headquarters (OAWM). The EPA Headquarters approval is necessary to insure that individual stations conform to the NAMS selection criteria and the network as a whole is sufficient in terms of numbers and location for purposes of national analyses.

Table 2. TSP NATIONAL AIR MONITORING STATION CRITERIA
(Approximate Number of Stations Per Area)[a]

Population category	High concentration[b]	Medium concentration[c]	Low concentration[d]
High Population > 500,000	6 - 8	4 - 6	0 - 2
Medium Population 100,000 - 500,000	4 - 6	2 - 4	0 - 2
Low Population 50,000 - 100,000	2 - 4	1 - 2	0

[a] Selection of urban areas and actual numbers of stations per area will be jointly determined by EPA and the State agency.

[b] High concentration - violating primary NAAQS by 20 percent or more.

[c] Medium concentration - violating secondary NAAQS.

[d] Low concentration - less than secondary NAAQS.

The estimated number of TSP monitors required in the NAMS network will range from approximately 500 to 1000. This range of stations is based on a statistical analysis of the data and computations of the probability of detecting certain rates of change over a specific number of years. An assumption was made that the variability was 20 percent, i.e., a 95 percent confidence interval around the annual mean would be 20 percent. This assumption may be regarded as a "ballpark figure." The sampling error from an every sixth-day schedule would be roughly 10 percent, so an overall vaiability of 20 percent may be regarded as a reasonable approximation.

For TSP, it is unlikely that the same rate of change would apply throughout the nation. Regional differences in the TSP problem make it essential that the networks also be useful for regional trend assessments. In most practical applications, trends will be assessed on the basis of 3-5 years of data to minimize the impact of meteorological influences. With 50 to 100 sites in each geographical region, there is a reasonably good chance of detecting 3-year trends of more than 2 percent per year.

Using a TSP trend network of 500-1000 sites there would be a reasonable chance of determining 5-year trends of more than 3 percent per year in the medium population cities with high TSP, but less than 50/50 chance of detecting 3-year trends of less than 5 percent per year in any city. Therefore, the overall range of 500-1000 NAMS TSP monitors seems to be acceptable for the purposes of national and regional trends. The actual number of monitors in any specific area would depend on local factors such as meteorology, topography, urban and regional air quality gradients, and the potential for significant air quality improvement or degradation. Generally, the greatest density of stations would occur in the northeastern States, where urban populations are large and where pollutant levels are high.

Generally, the worst air quality in an urban area should be used as the basis for

determining the required number of TSP NAMS (see table 2). This will usually exclude air quality levels caused predominantly by a single source, especially if the maxima occur in remote areas. However, if the source impacts in populated parts of an urban area, then it would not necessarily be excluded. Therefore, both category (a) sites (neighborhood scale) and category (b) sites (neighborhood scale) as discussed in section 3 would be needed.

3.2 Sulfur dioxide (SO_2) design criteria for NAMS. As with TSP monitoring, it is desirable to have a greater number of NAMS in the more polluted and densely populated urban and multisource areas. The data in table 3 show the approximate number of permanent monitors needed in urban areas to characterize the national and regional SO_2 air quality trends and geographical patterns. These criteria require that the number of monitoring stations in areas where urban populations exceed 500,000 and concentrations also exceed the primary NAAQS may range from 6 to 8 and that in areas where the SO_2 problem is minor, only one or two (or no) monitors are required. The actual number and location of the stations will be determined jointly by EPA and the State agency.

Table 3. SO_2 NATIONAL AIR MONITORING STATION CRITERIA (Approximate Number of Stations Per Area)[a]

Population category	High concentration[b]	Medium concentration[c]	Low concentration[d]
High Population > 500,000	6 - 8	4 - 6	0 - 2
Medium Population 100,000 - 500,000	4 - 6	2 - 4	0 - 2
Low Population 50,000 - 100,000	2 - 4	1 - 2	0

[a] Selection of urban areas and actual number of stations per area will be jointly determined by EPA and the State agency.

[b] High concentration - violating primary NAAQS.

[c] Medium concentration - violating 60 percent of secondary NAAQS.

[d] Low concentration - less than 60 percent of primary or secondary NAAQS.

The estimated number of SO_2 monitors which would be required in the NAMS network ranges from approximately 150 to 450. This range in the number of stations is less than for TSP. This is because there are more urban areas with low SO_2 levels than with low TSP levels. Also, the background air quality levels are higher for TSP than for SO_2, and thus air quality is more sensitive to SO_2 emission changes than for TSP. Therefore, fewer monitoring stations are needed on a national basis than for TSP. The actual number of monitors in any specific area depends on local factors such as meteorology, topography, urban and regional air quality gradients, and the potential for significant air quality improvements or degradation. The greatest density of stations should be where urban populations are large and where pollution levels are high. Fewer monitors are necessary in the western States since concentrations are seldom above the NAAQS in their urban areas. Exceptions to this are in areas where an expected shortage of clean fuels indicates that ambient air quality may be degraded by increased SO_2 emissions. In such cases, the minimum number of NAMS is required to provide EPA with a proper national perspective on significant changes in air quality.

Like TSP, the worst air quality in an urban area is to be used as the basis for determining the required number of SO_2 NAMS (see table 3). This will usually exclude air quality levels caused predominantly by single point source emissions, such as remote power plants or smelters, especially if the maxima occur in remote areas. If the source impacts in populated parts of an urban area, then it would not necessarily be excluded. Therefore, category (a) sites (neighborhood scale) and category (b) sites (neighborhood scale) as discussed in section 3 would be needed.

3.3 Carbon monoxide (CO) design criteria for NAMS. Information is needed on ambient CO levels in major urbanized areas where CO levels have been shown or inferred to be of significant concern. At the national level, EPA will not routinely require data from as many monitors as are required for TSP, and perhaps, SO_2, since CO trend stations are principally needed to assess the overall air quality progress resulting from the emission controls required by the Federal motor vehicle control program (FMVCP).

Although State and local air programs may require extensive monitoring to document and measure the local impacts of CO emissions and emission controls, an adequate national perspective is possible with as few as two monitors per major urban area. The two categories which would require CO NAMS are: (a) Peak concentration areas such as are found around major traffic arteries and near heavily traveled streets in downtown areas (middle scale); and (b) neighborhoods where concentration exposures are significant (neighborhood scale).

The peak concentration station (middle scale) is usually found near heavily traveled downtown streets (street canyons), but could be found along major arterials (corridors), either near intersections or at low elevations which are influenced by downslope drainage patterns under low inversion conditions. the peak concentration station should be located so that it is representative of several similar source configuations in the urban area, where the general population has access. Thus, it should reflect one of many potential peak situations which occur throughout the urban area. It is recognized that this does not measure air quality which represents large geographical areas. Thus, a second type of station on the neighborhood scale is necessary to provide data representative of the high concentration levels which exist over larger geographical areas.

The neighborhood station (neighborhood scale) should be located in areas with a stable, high population density, projected continuity of neighborhood character, and high traffic density. The stations should be located where no major zoning changes, new highways, or new shopping centers are being considered. the station should be where a significant CO pollution problem exists, but not be under the influence of any one line source. Rather, it should be more representative of the overall effect of the sources in a significant portion of the urban area.

Because CO is generally associated with heavy traffic and population clusters, urbanized area population greater than 500,000 is the principal criterion for identifying candidate urban areas for which pairs of NAMS for this pollutant will be required to meet the needs described above. In addition, areas where CO ambient levels are known to be a problem may also be required to maintain NAMS. Therefore, two monitors for CO trends will be located in any urbanized area with a population greater than 500,000. This is based on judgment that

monitors in urban areas with greater than 500,000 population would provide sufficient data for national analysis and national reporting to Congress and the public for major metropolitan areas. Also, it has generally been shown that major CO problems are found in areas of greater than 500,000 population.

3.4 Photochemical oxidants (O_3) design criteria for NAMS. The criteria for selecting NAMS ozone monitoring locations is any urbanized area having a population of more than 200,000. This population cutoff is used since the sources of hydrocarbons are both mobile and stationary and are more diverse. Also, because of local and national control strategies and the complex chemical process of ozone formation and transport, more sampling stations than for CO are needed on a national scale to better understand the ozone problem. This selection criterion is based entirely on population and will include those relatively highly populated areas where most of the oxidant precursors originate.

Each urban area will generally require only two national Ozone NAMS. One station would be representative of maximum ozone concentrations (category (a), urban scale) under the wind transport conditions as discussed in section 2.5. The exact location should balance local factors affecting transport and buildup of peak O_3 levels with the need to represent population exposure. The second station (category (b), neighborhood scale), should be representative of high density population areas on the fringes of the central business district along the predominant summer/fall daytime wind direction. This latter station should sense peak O_3 levels under light and variable or stagnant wind conditions. Two NAMS ozone stations will be sufficient in most urban areas since spatial gradients for ozone generally are not as sharp as for other criteria pollutants.

3.5 Nitrogen dioxide (NO_2) criteria for NAMS. Nitrogen dioxide monitors will be required in those areas of the country which have a population greater than 1,000,000. These areas will have two NO_2 NAMS. It is felt that monitors in these major metropolitan areas would provide sufficient data for a national analysis of the data, and also because NO_2 problems occur in areas of greater than 1,000,000 population.

Urban areas where the population exceeds one million, should have permanent trend stations because of the general association between population and high annual average NO_2 levels, and also to assure appropriate representation of populous areas. Over 50 percent of these areas now monitoring show annual averages exceeding 75 $\mu g/m^3$. Future growth and growing concern over peak NO_2 concentration effects will necessitate national assessments for these areas. At a later date, if a short-term standard should be set, additional areas may need to be added depending on the value of the short-term NAAQS.

Within urban areas requiring NAMS, two permanent monitors are sufficient. The first station (category (b), neighborhood scale), would be to measure the photochemical production of NO_2 and would best be located in that part of the urban area where the emission density of NO_x is the highest. The second station (category (b), urban scale), would be to measure the NO_2 produced from the reaction of NO with O_3, and should be downwind of the area of peak NO_x emission areas.

4. REFERENCES

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APPENDIX E—PROBE SITING CRITERIA FOR AMBIENT AIR QUALITY MONITORING

1. Introduction.
2. Total suspended particulates (TSP).
2.1 Vertical placement.
2.2 Spacing from obstructions.
2.3 Spacing from roads.
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4.1 Spacing from roads.
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1. INTRODUCTION

This appendix contains probe siting criteria to be applied to ambient air quality monitors after the general monitor location has been selected based on the monitoring objectives and spatial scale of representativeness as discussed in appendix D. Adherence to these criteria is necessary to ensure the uniform collection of air quality data, which is essential for producing compatible and comparable data.

The probe siting criteria as discussed below must be followed to the maximum extent possible to ensure uniform collection of air quality data. It is recognized that there may be situations when the probe siting criteria cannot be followed. If the site does not meet the siting criteria, this must be thoroughly documented as to how it differs and why. This documentation should help to avoid later questions about the data.

The spatial scales of representativeness used in this appendix, i.e., middle, neighborhood, and urban, are defined and discussed in appendix D of this part. The pollutant specific probe siting criteria generally apply to all spatial scales. For CO and NO_2 sites, there are siting differences between the middle and neighborhood scales.

2. TOTAL SUSPENDED PARTICULATES (TSP)

2.1 Vertical placement. The most desirable height for a TSP monitor is near the breathing height. Practical considerations such as prevention of vandalism, security, accessibility, availability of electricity, etc., require that the sampler be elevated and require that a range of acceptable heights need to be specified. Therefore, the TSP monitor must be located 2 to 15 meters above ground level. The lower limit was based on a compromise between ease of servicing the sampler and the desire to avoid reentrainment from dusty surfaces. The upper limit represents a compromise between the desire to have measurements which are most representative of population exposures, and the consideration for the location of existing monitors.

2.2 Spacing from obstructions. If the sampler is located on a roof or other structure, then there must be a minimum of 2 meters separation from walls, parapets, penthouses, etc. No furnace or incineration flues should be nearby. This separation distance is dependent on the height of the flues, type of waste or fuel burned, and quality of the fuel. For example, if the emissions from the chimney are the result of natural gas combustion, no special precautions are necessary except for the avoidance of obstructions, i.e., at least 2 meters separation. On the other hand, if fuel oil, coal, or solid wastes are burned and the stack is sufficiently short so that the plume could reasonably be expected to impact on the sampler probe a significant part of the time, other buildings/locations in the area that are free from these types of sources should be considered for sampling. Trees provide surfaces for particulate deposition and also restrict airflow. Therefore, the sampler must be placed at least 20 meters from trees. The sampler must also be located away from obstacles such as buildings, so that the distance between obstacles and the sampler is at least twice the height that the obstacle protrudes above the sampler. There must also be unrestricted airflow in at least three of the four cardinal (N, E, S, W) wind directions, and at least one of the three must be the predominant direction for the season of greatest potential pollutant concentration.

2.3 Spacing from roads. A number of studies(*1-8*) support the conclusion that TSP concentrations decrease with increasing height of the monitor and distance from the road. Quite high concentrations have been reported at monitors located at a low elevation close to heavily traveled roads. Such monitors are not generally representative of 24-hour population exposure. This is because people do not generally locate in close proximity to streets for such periods

of time. Moreover, monitors located close to streets are within the concentrated plume of particulate matter emitted and generated by vehicle traffic. Except for special purpose monitoring studies where the monitoring objective is to determine the impact of a single source, ambient monitors should not be located so as to measure the plume of a single source. For TSP, it is appropriate that ambient monitors be located beyond the concentrated particulate plume generated by traffic, and not so close that the roadway totally dominates the measured ambient concentration.

Therefore, TSP ambient monitors must be located at a point where the plume generated by vehicular traffic is substantially diminished. This would apply to those cases where the traffic is greater than several thousand vehicles per day. Figure 1 shows the requirement for siting monitors so that they are placed beyond the most concentrated portion of the plume. It contains a zone (zone B) where the impact of the roadway plume is lessened. The division between zone A and zone B is a linear relationship between sample height and distance from roadways, which represents locations to avoid to minimize unreasonable roadway influences. This relationship is supported by an analysis of the data in the above referenced studies.(9)

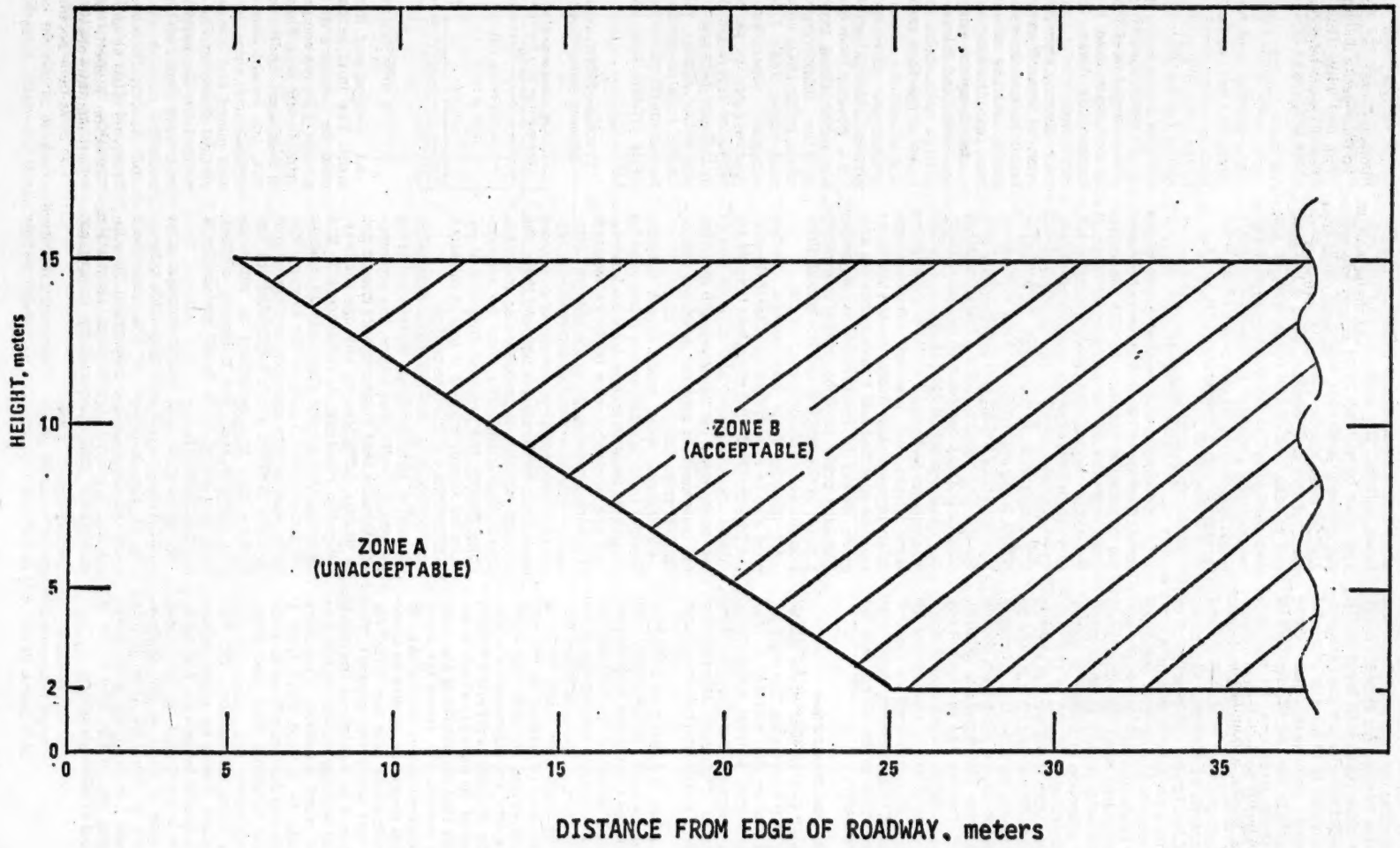

Figure 1. Acceptable zone for siting TSP monitors

In light of several street canyon studies cited above, it appears that the street canyon may confine the roadway plume and not be a suitable location for ambient monitors. However, since roads with lower traffic (several thousand vehicles per day) are generally not considered to be a major source of vehicular-related pollutants, this curve would not preclude the use of monitors in zone A for those situations. In addition, other factors such as meteorological anomalies, actual level of emissions from streets, potential exposure, and availabililty and physical constraints of sites may constitute sufficient justification for the location of, or continuation of, a site located in zone A.

2.4 Other considerations. The collection efficiency for large-diameter suspended particulates is dependent upon the orientation of the sampler with respect to wind direction.(*10*) The collection efficiency is higher if the wind direction is at 45° to the sampler's roof ridge than if the wind is parallel to the roof ridge. The orientation should be considered to maximize collection efficiency in cases where the annual wind roses show a predominance from one direction (islands, sea coasts, etc.). Further, the site should not be located in an unpaved area unless there is vegetative ground cover year round so that the impact of reentrained or fugitive dusts will be kept to a minimum. Additional information on TSP probe siting may be found in reference(*11*).

3. SULFUR DIOXIDE(SO_2)

3.1 Horizontal and vertical probe placement. As with TSP monitoring, the most desirable height for an SO_2 monitor is near the breathing height. Various factors enumerated before may require that the inlet probe be elevated. Therefore, the monitor must be located 3 to 15 meters above ground level.

If the inlet probe is located on a rooftop or an intermediate height on a building, the inlet probe must be located less than 80 percent of the mean height of the buildings in the vicinity but at least 3 meters above the ground level. Vertical uniform SO_2 distributions up to at least the mean building height over the area of interest in the city can be assumed except for near the windward edge of a city, see reference (*12*). The choosing of the 80 percent criteria provides a safety factor of 20 percent, which is intended to insure that the effects of any nonuniformity in vertical SO_2 levels are minimized. Thus, concentrations measured at or below this level should be similar to those existing concentrations near the breathing zone (5 to 6 feet above the ground). The inlet probe should be located on the windward side of the building relative to the prevailing winter wind direction. The inlet probe must also be located more than 1 meter vertically and horizontally away from any supporting structure and also away from dirty, dusty areas.

3.2 Spacing from obstructions. No furnace, incineration flues, or other minor sources of SO_2 should be nearby. The separation distance is dependent on the height of the flues, type of waste or fuel burned, and the quality of the fuel. Inlet probes must be at least 1 meter from walls, parapets, penthouses, etc., if the inlet probe is located on a roof or other structure.

The sampler must be placed more than 20 meters from trees and must also be located away from obstacles and buildings. the distance between the obstacles and the sampler must be at least twice the height that the obstacle protrudes above the sampler. Airflow must also be unrestricted in at least three of the four cardinal wind directions, and at least one of the three must be the dominant direction for the season of greatest potential pollutant concentration. Additional information on SO_2 probe siting criteria may be found in reference (*12*).

4. CARBON MONOXIDE (CO)

4.1 Horizontal and vertical probe placement. Because of the importance of measuring population exposure to CO concentrations, air should be sampled at average breathing heights. However, practical factors require that the air sampler be higher. The required height of the inlet probe for CO monitoring is therefore $3\pm\frac{1}{2}$ meter, which is a compromise between representative breathing height and prevention of vandalism. The recommended 1 meter range of heights is also a compromise to some extent. For consistency and comparability, it would be desirable to have all inlets at exactly the same height, but practical considerations often prevent this. Some reasonable range must be specified and 1 meter provides adequate leeway to meet most requirements. The inlet probe must be located more than 1 meter in the vertical and horizontal direction from any supporting structure.

4.2 Spacing from obstructions. Airflow must also be unrestricted in at least three of the four cardinal wind directions (except for middle scale stations), and at least one of the three must be the dominant direction for the season of greatest potential pollutant concentration.

4.3 Spacing from roads. Street canyon/corridor (middle scale) sensor inlets must be located at least 10 meters from an intersection and preferably at a midblock location. Midblock locations are preferable to intersection locations because intersections represent a much smaller portion of downtown space than do the streets between them. Pedestrian exposure is probably also greater in street canyon/corridors than at intersections. Finally, the practical difficulty of positioning sampling inlets is less at midblock locations than at the intersection.

In determining the minimum separation between a neighborhood scale monitoring site and a specific line source, the presumption is made that measurements should not be unduly influenced by any one roadway. Using the equations in reference (*13*) and assuming that no one street should contribute greater than 2 ppm to the average, stability class is very unstable, and the source strength is 0.007 g/m-s (equivalent to 500 vehicles/hr.), the equations in reference (*13*) indicate that the minimum setback from any street must be 35 meters for a neighborhood site.

Street canyon and traffic corridor sites (middle scale) are chosen to provide a measure of the influence of the immediate source on the pollution exposure of the population. In order to provide some reasonable consistency and comparability in the air quality data from monitors, a minimum distance of 2 meters and a maximum distance of 10 meters from the roadway must be maintained for the sites. This should give consistency to the data, yet still allow flexibility in finding suitable locations for CO monitoring. Additional information on CO probe siting may be found in reference (*13*).

5. PHOTOCHEMICAL OXIDANT

5.1 Vertical and horizontal probe placement. The inlet probe for photochemical oxidant monitors should be as close as possible to the breathing zone. However, the complicating factors discussed previously require that the probe be elevated. The inlet height of the probe must be located 3 to 15 meters above ground level. The probe must also be located more than 1 meter vertically and horizontally away from any supporting structure.

5.2 Spacing from obstructions. The probe must be located away from obstacles and buildings, and the distance between the obstacles and the sampler probe must be at least twice the height that the obstacle protrudes above the sampler. The probe must also be located at least 20 meters from trees. Airflow must be unrestricted in at least three of the four cardinal wind directions, and at least one of the three must be in the predominate direction for the season of greatest potential pollutant concentration.

5.3 Spacing from roads. It is important in the probe siting process to minimize destructive interferences from sources of nitric oxide (NO) since NO readily reacts with ozone. Table 1 provides the required minimum separation distances between roadways and ozone monitoring sites. The minimum separation distance must also be maintained between an ozone monitor and any other similar volume of automotive traffic, such as parking lots. Additional information on photochemical oxidant probe siting criteria may be found in reference (*14*).

TABLE 1.—*Minimum separation distance between ozone monitors and roadways*

Roadway average daily traffic, vehicles per day	Minimum separation distance from roadways to monitor, meters
< 1,000	20
1,000 to 10,000	20 - 250[a]
> 10,000	> 250

[a] Distances should be interpolated based on traffic flow.

6. NITROGEN DIOXIDE (NO_2)

6.1 Vertical and horizontal probe placement. The inlet height of the NO_2 probe must be located 3 to 15 meters above the ground. This is a compromise between measuring in the breathing zone and avoidance of vandalism, finding suitable sites, etc. For NO_2, the height does not appear to be a critical factor since the NO_2 should be fairly well mixed and somewhat uniform in the vertical direction. The distance of the inlet probe from the supporting structure must be greater than 1 meter vertically and horizontally.

6.2 Spacing from obstructions. Buildings, trees, and other obstacles may possibly scavenge NO_2. In order to avoid this kind of interference, the monitor must be located well

away from such obstacles so that the distance between obstacles and the sampler is at least twice the height that the obstacle protrudes above the sampler. For similar reasons, a probe inlet along a vertical wall is undesirable because air moving along that wall may be subject to possible removal mechanisms. The inlet probe must also be at least 20 meters from trees. There must be unrestricted airflow in at least three of the four cardinal wind directions, and at least one of the three must be the predominate direction for the season of greatest pollutant concentration.

6.3 Spacing from roads. It is important that the monitoring site be removed from oxides of nitrogen sources to avoid measurements being dominated by any one source and to allow time for conversion (reactions) of NO emissions to NO_2. Further, the effects of roadway sources must be minimized by using separation distances for neighborhood and urban scale stations found in table 2. The minimum separation distance must also be maintained between an NO_2 monitor and any other similar volume of automotive traffic such as parking lots. If the separation distances are less than those shown in table 2, the monitoring station would be classified as a middle scale station. Additional information on NO_2 probe siting criteria may be found in Reference (*14*).

TABLE 2.—*Minimum separation distance between NO_2 monitors and roadways (neighborhood and urban scales)*

Roadway average daily traffic, vehicles per day	Minimum separation distance from roadways to monitor, meters
< 1,000	20
1,000 to 10,000	20 - 250[a]
> 10,000	> 250

[a]Distances should be interpolated based on traffic flow.

7. DISCUSSION AND SUMMARY

Table 3 presents a summary of the requirements for probe siting criteria with respect to distances and heights. It is apparent from table 3 that different elevation distances above the ground are shown for the various pollutants. The discussion in the text for each of the pollutants enumerated the factors why the monitor must be elevated. The differences in the specified range of heights are based on the vertical concentration gradients. For CO, the gradients in the vertical direction are very large, so a small range of heights has been specified. For SO_2, NO_2, TSP, and O_3 (except near roadways), the vertical gradients are smaller and thus a larger range of heights can be used. The upper limit of 15 meters was specified for consistency between pollutants and to allow the use of a single manifold for monitoring more than one pollutant at a site.

Table 3. SUMMARY OF PROBE SITING CRITERIA

Pollutant	Height above ground, meters	Distance from supporting structure, meters		Other spacing criteria
		Vertical	Horizontal[a]	
TSP (All spatial scales)	2 - 15	--	>2	a. >20 meters from trees. b. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. c. Unrestricted airflow in 3 of 4 cardinal wind directions. d. No furnace or incineration flues[b] should be nearby. e. Spacing from roads varies with height of monitor(see text).
SO_2 (All spatial scales)	3 - 15	>1	>1	a. Probe on roof or intermediate height on a building must be <0.8 of the mean height of the buildings in the neighborhood. b. >20 meters from trees. c. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. d. Unrestricted airflow in 3 of 4 cardinal wind directions. e. No furnace or incineration flues[b] should be nearby.
CO (Middle scale)	3 ± 1/2	>1	>1	a. >10 meters from intersection and at midblock location. b. 2-10 meters from roadway.
CO (Neighborhood scale)	3 ± 1/2	>1	>1	a. >35 meters from roadway. b. Unrestricted air flow in 3 of 4 cardinal wind directions.
O_3 (All spatial scales)	3 - 15	>1	>1	a. >20 meters from trees. b. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. c. Unrestricted airflow in 3 of 4 cardinal wind directions. d. Spacing from roads varies with roadway traffic (see text).
NO_2 (All spatial scales)	3 - 15	>1	>1	a. >20 meters from trees. b. Distance from sampler to obstacle, such as buildings, must be at least twice the height the obstacle protrudes above the sampler. c. Unrestricted airflow in 3 of 4 cardinal wind directions. d. Spacing from roads varies with roadway traffic (see text).

[a] When probe is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.

[b] Distance is dependent on height of furnace or incineration flue, type of waste or fuel burned, and quality of fuel (sulfur and ash content). This is to avoid undue influences from minor pollutant sources.

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APPENDIX F—SLAMS AIR QUALITY ANNUAL REPORT

1. GENERAL

This appendix describes information to be compiled annually and submitted to EPA for each ambient monitor in the SLAMS network in accordance with § 58.26. This information contains the minimum statistics needed by EPA to overview national air quality status. A uniform air quality format is necessary to convey meaningful information to a variety of interested parties including environmental groups, various Federal agencies, the Congress, and private citizens upon request. As indicated by § 58.26(d), the statistics included in the State report shall be certified by the State program director to be accurate to the best of his knowledge. A certified statement to this effect shall be included with the report.

2. REQUIRED INFORMATION

The required information is itemized below by pollutant.

2.1 Sulfur dioxide (SO_2).
County name.
SAROAD site code.
Sampling method.
Number hourly observations.[1]
Number daily observations.[2]
Sampling schedule.
Annual arithmetic mean ($\mu g/m^3$).
Highest and second highest 24-hour averages [3] ($\mu g/m^3$).
Highest and second highest 3-hour values [1,3] ($\mu g/m^3$).
Number of 24-hour average concentrations [4] in ranges:

Range:	No. of values
0 to 80 ($\mu g/m^3$)	
81 to 250	
251 to 365	
366 to 800	
801 to 1,600	
1,601 to 2,100	
2,101 to 2,620	
Greater than 2,620	

2.2 Particulates (TSP).
County name.
SAROAD site code.
Sampling method.
Number of observations.
Sampling schedule.
Annual geometric mean ($\mu g/m^3$).
Highest and second highest daily values ($\mu g/m^3$).
Number of daily concentrations in ranges:

Range:	No. of values
0 to 75 ($\mu g/m^3$)	
76 to 150	
151 to 260	
261 to 375	
376 to 625	
626 to 875	
876 to 1,000	
Greater than 1,000	

2.3 Carbon monoxide (CO).
County name.
SAROAD site code.
Sampling method.
Number of hourly observations.
Sampling schedule.
Highest and second highest 8-hour values [3] (mg/m^3).
Highest and second highest 1-hour values (mg/m^3).
Number of 8-hour average concentrations [5] in ranges:

Range:	No. of values
0 to 5.0 (mg/m^3)	
5.1 to 10.0	
10.1 to 17.0	
17.1 to 34.0	
34.1 to 46.0	
46.0 to 57.5	
Greater than 57.5	

2.4 Nitrogen dioxide (NO_2).
County name.
SAROAD site code.
Sampling method.
Number of hourly observations.[1]
Number of daily observations.[2]
Sampling schedule.
Annual arithmetic mean ($\mu g/m^3$).
Highest and second highest 24-hour averages [6] ($\mu g/m^3$).
Highest and second highest hourly averages [1] ($\mu g/m^3$).
Number of hourly average concentration in ranges:[1]

Range:[1]	No. of values
0 to 50 ($\mu g/m^3$)	
51 to 100	
101 to 300	
301 to 600	
601 to 1,130	
1,131 to 2,260	
2,261 to 3,000	
3,001 to 3,750	
Greater than 3,750	

[1] A range ending with the level of the short-term NO_2 air quality standard will be added whenever EPA promulgates such a standard.

2.5 Oxidants (O_3).
County name.
SAROAD site code.
Sampling method.
Number hourly observations.
Sampling schedule.
Five highest hourly averages ($\mu g/m^3$).
Number of hourly concentrations in ranges:

Range:	No. of values
0 to 80 ($\mu g/m^3$)	
81 to 160	
161 to 200[1]	
201[1] to 400	
401 to 800	
801 to 1,000	
1,001 to 1,200	
Greater than 1,200	

[1] This breakpoint is likely to be altered pending change in Federal alert level.

3. REFERENCES

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APPENDIX G—UNIFORM AIR QUALITY INDEX AND DAILY REPORTING

1. GENERAL

This appendix describes the uniform air quality index to be used by States in reporting the daily air quality index required by § 58.40.

2. DEFINITIONS

a. "Reporting agency" means the applicable State agency or, in metropolitan areas, a local air pollution control agency designated by the State to carry out the provisions of § 58.40.

b. "Reporting area" means the geographical area for which the daily index is repre-

[1] Continuous methods only.
[2] Manual or intermittent methods only.
[3] Based on nonoverlapping values computed according to procedures described in reference. (1).
[4] Based on midnight to midnight for continuous methods.
[5] Based on three nonoverlapping periods of midnight to 8 a.m., 8 a.m. to 4 p.m., 4 p.m. to midnight.
[6] Based on midnight to midnight period for continuous methods.

sentative for the reporting period. This area(s) may be the total urban area (or subpart thereof) or each of any number of distinct geographical subregions of the urban area deemed necessary by the reporting agency for adequate presentation of local air quality conditions.

c. "Reporting day" means the calendar day during which the daily report is given.

d. "Reporting period" means the time interval for which the daily report is representative. Normally, the reporting period is the 24-hour period immediately preceding the time of the report and should coincide to the extent practicable with the reporting day. In cases where the index will be forecasted the reporting period will include portions of the reporting day for which no monitoring data are available at the time of the report.

e. "Critical pollutant" means the pollutant or pollutant combination (TSP x SO_2) with the highest subindex during the reporting period.

f. "Subindex" means the calculated index value for a single pollutant as described in paragraph 7.

3. MONITORING DATA

The monitoring data used to prepare the daily index report must be based on data obtained from the SLAMS network (or portions thereof) required under 40 CFR 58.20. Air quality measurements need not be made on reporting days for which the agency does not ordinarily schedule monitoring to occur. For example, TSP measurements are to be included in index calculations on days for which data are required (minimum of one sample per 6 days), but may be excluded on other days. Particulate measurements from samplers other than the hi-volume sampler, may be included in index calculations provided such measurements can be quantitatively related to hi-volume measurements.

Data used to calculate the daily index (and respective subindices) should come from the most recent sampling period. the index should be based on data obtained during the 24-hour period for which the index is reported. No monitoring data are to be used for index calculations for which the end of the sampling period precedes the reporting day by more than 24 hours. To the extent practicable, agencies should forecast the index using whatever procedures are most accurate and reasonable through consideration of local meteorological and topographical conditions and the availability of data and forecasting expertise.

4. GEOGRAPHIC APPLICABILITY

Generally, the area contained within the geographic boundaries of the urban area is sufficient for purposes of calculating and reporting the index. The exception occurs in cases where a significant air quality problem exists (PSI greater than 100) in highly populated areas adjacent to, but outside of, the urban area. For example, ozone concentrations are often highest downwind and outside the urban area.

Agencies should report a separate air quality index for each distinct subregion of the urban area for which air quality differences are likely to be significant and where monitoring data are readily available. At a minimum, the subregion subject to the highest index values shall be included in the index computation. this subregion shall be selected by the reporting agency after past air quality has been reviewed to determine which monitoring stations typically record the highest pollutant concentrations.

5. DAILY INDEX REPORT

The daily index report must be based on the uniform air quality index described in paragraph 7 and contain the following information: (1) The reporting area(s); (2) the reporting period; (3) the critical pollutant; (4) the subindex corresponding to the critical pollutant; and (5) the descriptor word according to the following system:

Index Range	Descriptor Category
0 to 50	"Good"
51 to 100	"Moderate"
101 to 199	"Unhealthful"
200 to 299	"Very unhealthful"
300 and above	"Hazardous"

Reporting agencies should, at their discretion, report additional information such as the following: (1) Pollutants other than the critical pollutants and their individual subindices; (2) subindices and respective pollutant names for each of a number of distinct reporting areas within the urban area; and (3) actual pollutant concentration values.

6. PROMINENT PUBLIC NOTICE

The reporting agency shall make prominent public notice of the daily index report on at least 5 days per week. Prominent public notification consists of at a minimum: (1) Furnishing the daily report to one or more of the appropriate news media (radio, television, newspapers) and (2) making the daily index report publicly available at one or more places of public access. Index reports also may be disseminated by means of recorded telephone messages.

7. UNIFORM AIR QUALITY INDEX

The uniform index is based on the pollutants standards index (PSI) structure (see paragraph 10), which includes the five pollutants for which primary National Ambient Air Quality Standards (NAAQS) have been established. These pollutants are: Total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), photochemical oxidants (O_3) and nitrogen dioxide (NO_2). For each pollutant, a subindex is calculated from a segmented linear function that transforms ambient concentrations onto a scale extending from 0 through 500, with 100 corresponding to the primary NAAQS concentrations and 500 corresponding to the significant harm levels. The breakpoints between 100 and 500 are based on Federal episode criteria as defined in 40 CFR Part 51, Appendix L. In addition to the five health-related pollutants, a subindex is calculated for the product TSP x SO_2 because it has both Federal episode criteria and a significant harm level. The breakpoints used in defining each of the six pollutant subindices are listed in gravimetric units (Table 1) and volumetric units (Table 2). The individual computational scheme is defined below for calculating the pollutant subindex values.

7.1 Uniform index computation. Each subindex, i, is calculated by using a segmented linear function (figures 1-6) that relates pollutant concentration, X_i, to subindex value, I_i. A segmented linear function consists of straight-line segments joining discrete coordinates (i.e., breakpoints). For pollutant i and segment j, the coordinates of the jth breakpoint are represented by subindex value $I_{i,j}$ and concentration $X_{i,j}$ giving the ordered pair ($X_{i,j}$,$I_{i,j}$). If the observed concentration is X_i, the corresponding subindex value I_i is calculated using the following equation over the concentration range $X_{i,j} \leq X_i \leq X_{i,j+1}$:

$$I_i = \frac{I_{i,j+1} - I_{i,j}}{X_{i,j+1} - X_{i,j}} (X_i - X_{i,j}) + I_{i,j}$$

for $X_{i,j} \leq X_i \leq X_{i,j+1}$

where X_i=observed concentration for ith pollutant

$I_{i,j}$=PSI value for ith pollutant and jth breakpoint (Table 1 or 2)

$I_{i,j+1}$=PSI value for ith pollutant and $(j+1)$th breakpoint (Table 1 or 2)

$X_{i,j}$=concentration for ith pollutant and jth breakpoint (Table 1 or 2)

$X_{i,j+1}$=concentration for ith pollutant and $(j+1)$th breakpoint (Table 1 or 2)

Finally, the overall index is calculated as the maximum of n subindices:

$$PSI = \max (I_1, I_2, \ldots, I_i \ldots, I_n)$$

where I_i = subindex for ith pollutant

n = number of pollutants (for pollutant combinations)

7.2 Example computation. Suppose a TSP 24-hour concentration of 283 $\mu g/m^3$ is observed. The TSP subindex is calculated using equation 1 as follows. In Table 1, the observed concentration of X_1=283 $\mu g/m^3$ lies between 260 and 375 $\mu g/m^3$, therefore this computation is carried out for the second segment (j=2). For this segment, $X_{1,2}$=260 and $X_{1,3}$=375, with corresponding subindex values of $I_{1,2}$=100 and $I_{1,3}$=200. The computation is as follows:

$$I_1 = \frac{I_{1,3} - I_{1,2}}{X_{1,3} - X_{1,2}} (283 - X_{1,2}) + I_1 =$$

$$\frac{200 - 100}{375 - 260} (283 - 260) + 100 = \frac{100}{115} \cdot 23 + 100 = 120$$

Therefore, the TSP subindex is I_1=120. If four other pollutant subindices calculated in a similar manner from observations on the same date were: I_2=0, I_3=0, I_4=20, and I_5=30. Then, the overall index is reported as the maximum of these values:

$$PSI = \max (120,0,0,20,30) = 120$$

A typical report might contain the following statement: "Today's air quality index is 120 which is regarded as unhealthful. The responsible pollutant is suspended particulate matter. This report represents conditions prevailing over most of the downtown urban area for the previous 24-hour period ending at noon today." If the index were forecast for the next day, the following additional language might also be used: "The current forecast is for improved air quality tomorrow with the index not expected to exceed 80."

8. EXCEPTIONS

In many urban areas, a given air pollutant may exhibit low concentrations repetitively. At the discretion of the reporting agency, pollutants for which PSI values are consistently below 50 for an extended period (for example, a season or year) may be excluded in calculations of the daily index.

Because the index is for the purpose of achieving national uniformity of daily air quality reports, the following variations are not permitted unless approved by the EPA Administrator:

a. Exclusion of pollutants described in paragraph 7 from index calculations except as permitted above.

b. Incorporation of pollutants and/or pollutant combinations into the index not described in paragraph 7.

c. Use of breakpoints other than those given in table 1 or 2.

d. Use of descriptor words other than those given in paragraph 5.

9. REPORTING AGENCY RECORDKEEPING

The reporting agency shall keep annual records of the frequency with which reported index values occur in each of the index descriptor categories. These records must also indicate the pollutant-monitors in the SLAMS network being used for purposes of calculating the index for each reporting area. Such records must be made available for inspection at the request of the Administrator.

10. BASIS FOR PSI

The development and evaluation of the PSI index structure have been documented extensively.(*2-12*) The index was created as a result of a joint EPA/CEQ study(*2*) which identified problems resulting from the diversity of indices used in the United States and Canada. This report proposed design principles that could be used to develop a nationally uniform index to meet the needs of State and local agencies. The design principles on which PSI is based, along with previous versions of the index, have been presented in various scientific reports,(*3,4*) articles in technical journals,(*4,5,11*) and at various scientific meetings and conferences.(*7-10*) Most recently, the history of the development of PSI, along with its scientific rationale, has been summarized in a book.(*6*) In September, 1976, PSI was published in the FEDERAL REGISTER(*13*) for use by State and local air pollution control agencies on a voluntary basis. Approximately 1 year later, it had been adopted by 9 State and 21 local air pollution control agencies.(*10*)

11. ADDITIONAL INFORMATION

A variety of computational techniques have been developed to assist the user in calculating PSI in an accurate, convenient and rapid manner.(*6*) The primary techniques available are graphs (linear and logarithmic), nomograms, tables, and computer approaches. An EPA report(*14*) describes each technique, lists its advantages and disadvantages, includes examples of the methods, and provides nomograms and tables in both gravimetric and volumetric units. The nomograms are considered to be the most efficient way for computing the index and should be of greatest assistance to State and local agencies. Computer approaches for calculating PSI also are available.(*15*) These approaches lend themselves to applications with programmable hand calculators, minicomputers, or large-scale digital computers. A general computer program, Index plot, used in an earlier evaluation of PSI,(*11*) is available from EPA and is fully documented.(*15*) This computer program is useful for analyzing air quality data by means of PSI over relatively long periods (a month, a season, or a year). It plots the time series of daily index values on the line printer, generates and plots a histogram and cumulative frequencies of PSI values, computes summary data by subindex and descriptor category, computes overall statistics for PSI, and inventories all missing values in the data set. Agencies can use this program to translate all historical data collected at any station into the coresponding PSI values, and, thus, retain for recordkeeping purposes a uniform retrospective record of air quality.(*11,15*) Requests for these reports should be addressed to the Environmental Protection Agency Library, MD-35, Research Triangle Park, N.C. 27711.

Additional information on descriptive language to report with the index is provided in an earlier report(*1*) and in the quality criteria documents published for each air pollutant.(*16-20*) Additional information on meteorological forecasting services from the National Weather Service also is available in the literature.(*21,22*)

Additional information on the health effects of each air pollutant used in PSI is available in a brochure entitled, "Measuring Air Quality: The New Pollutant Standards Index," Printing Management Office (PM-215), U.S. Environmental Protection Agency, 401 M Street SW., Washington, D.C. 20460.

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Table 1. BREAKPOINTS FOR PSI (ψ) IN METRIC UNITS[a]

Breakpoints	PSI value (ψ)	24-hr. TSP $\mu g/m^3$	24-hr. SO_2 $\mu g/m^3$	TSP x SO_2 $(\mu g/m^3)^2$	8-hr. CO mg/m^3	1-hr. O_3 $\mu g/m^3$	1-hr. NO_2 $\mu g/m^3$
50% of primary short-term NAAQS	50	75[b]	80[b]	c	5	80	c
Primary short-term NAAQS	100	260	365	c	10	160	c
Alert level	200	375	800	$65x10^3$	17	400[d]	1130
Warning level	300	625	1600	$261x10^3$	34	800	2260
Emergency level	400	875	2100	$393x10^3$	46	1000	3000
Significant harm level	500	1000	2620	$490x10^3$	57.5	1200	3750

[a]At 25°C and 760 mm Hg.

[b]Annual primary NAAQS are substituted here and are interpreted on a 24-hour basis.

[c]No index value reported at concentration levels below those specified by the alert level criteria.

[d]For the PSI index 400 $\mu g/m^3$ appears to be a more consistent breakpoint between the descriptor words "Unhealthful" and "very unhealthful" than the O_3 alert level of 200 $\mu g/m^3$.

Table 2. BREAKPOINTS FOR PSI
(Parts per Million)

Breakpoints	PSI value (ψ)	24-hr. SO_2	TSP x SO_2 ($\mu g/m^3$ x ppm)	8-hr. CO	1-hr. O_3	1-hr. NO_2
50% of primary NAAQS	50	0.03[a]	b	4.5	0.04	b
Primary NAAQS	100	0.14	b	9	0.08	b
Alert level	200	0.30	24.82	15	0.2[c]	0.6
Warning level	300	0.60	99.66	30	0.4	1.2
Emergency level	400	0.80	150.1	40	0.5	1.6
Significant harm level	500	1.00	187.1	50	0.6	2.0

[a]Annual primary NAAQS.

[b]No index value reported at concentration levels below those specified by the Alert Level Criteria.

[c]For the PSI index, 0.2 ppm appears to be a more consistent breakpoint between the descriptor words "unhealthful" and "very healthful" than the O_3 Alert Level of 0.1 ppm.

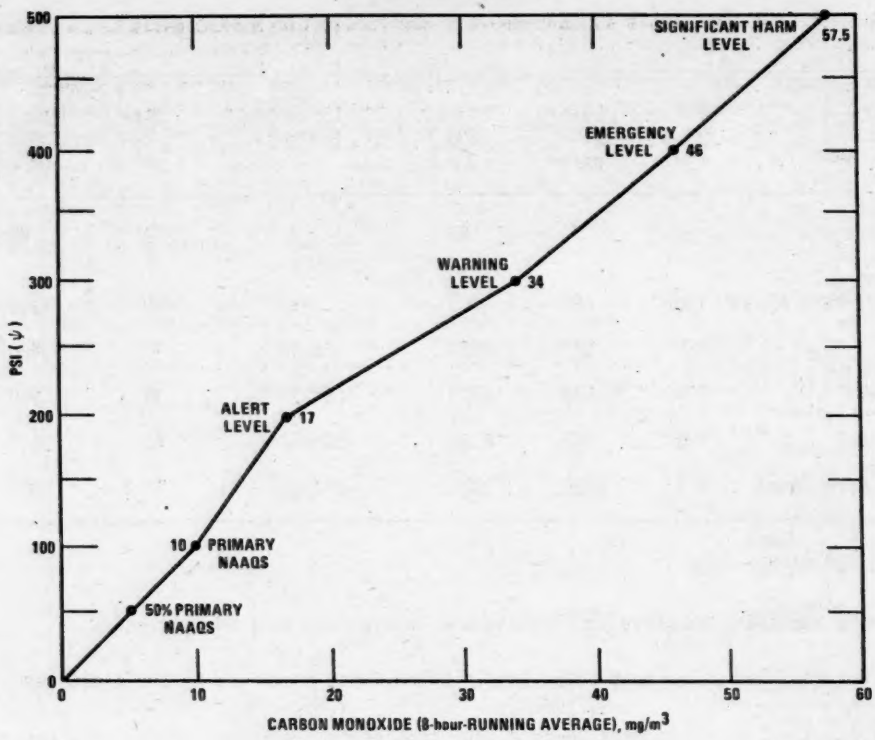

Figure 1. PSI function for carbon monoxide.

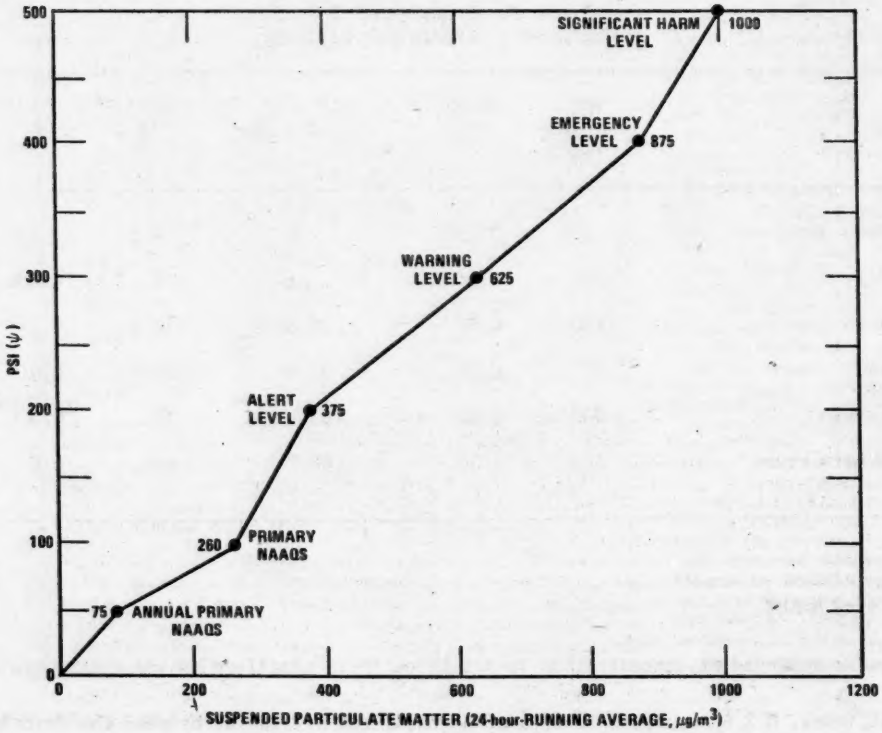

Figure 2. PSI function for suspended particulate matter.

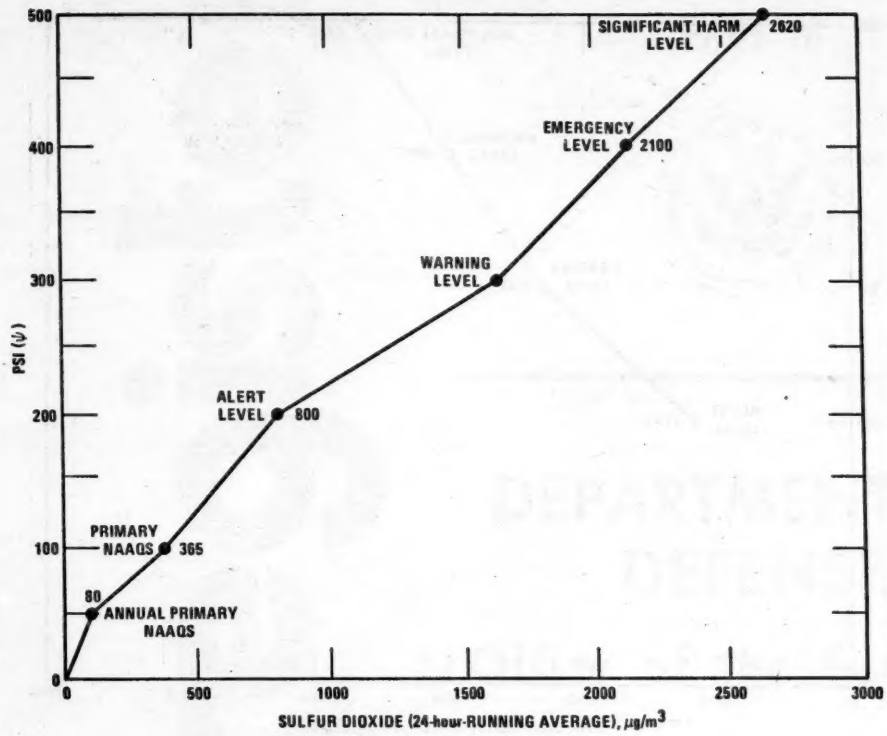

Figure 3. PSI function for sulfur dioxide.

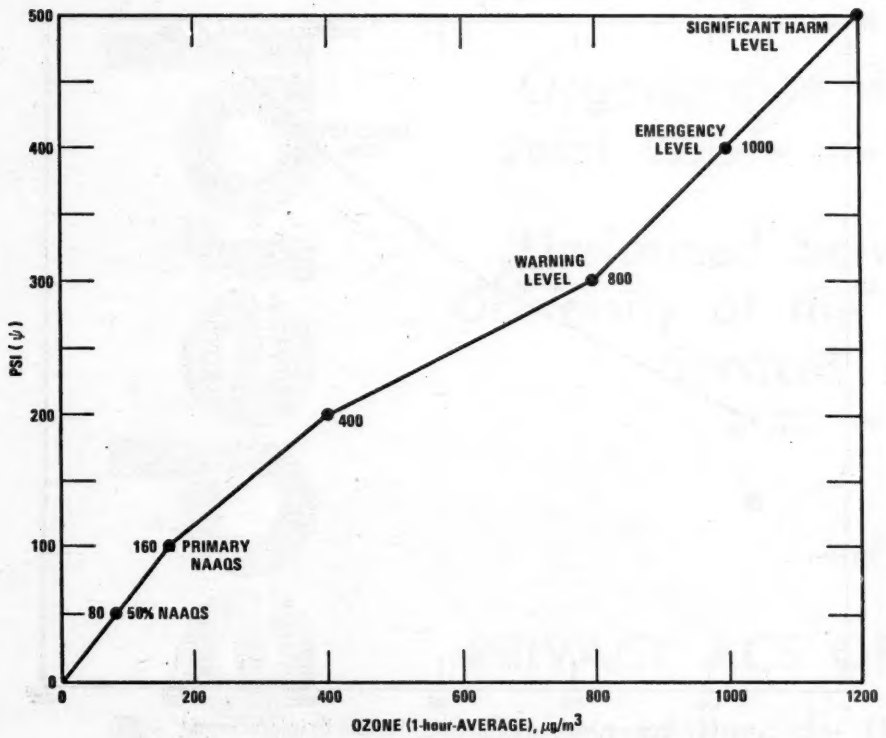

Figure 4. PSI function for photochemical oxidants.

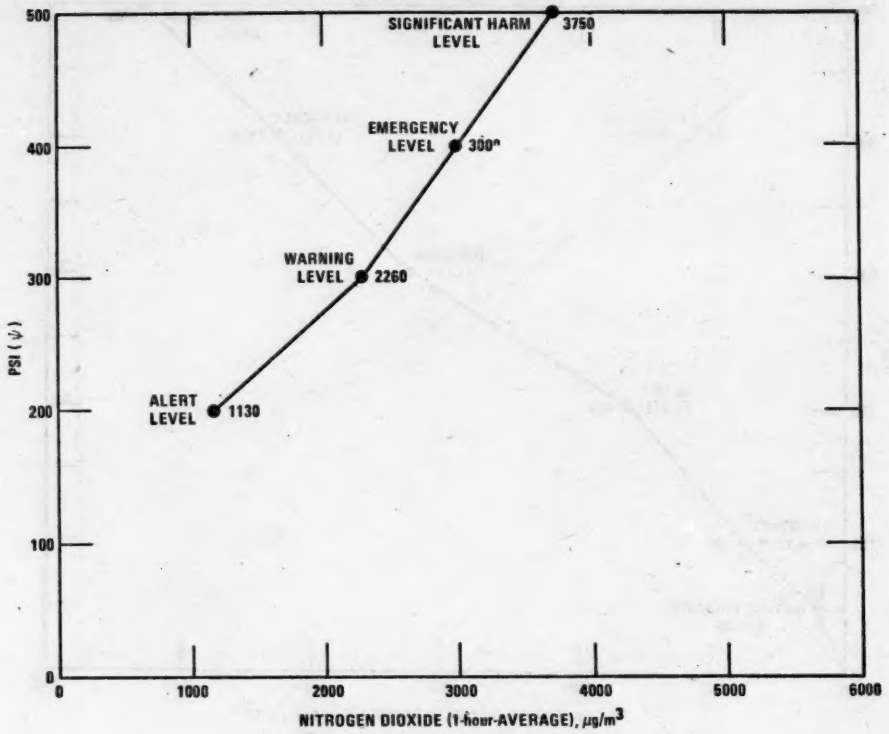

Figure 5. PSI function for nitrogen dioxide.

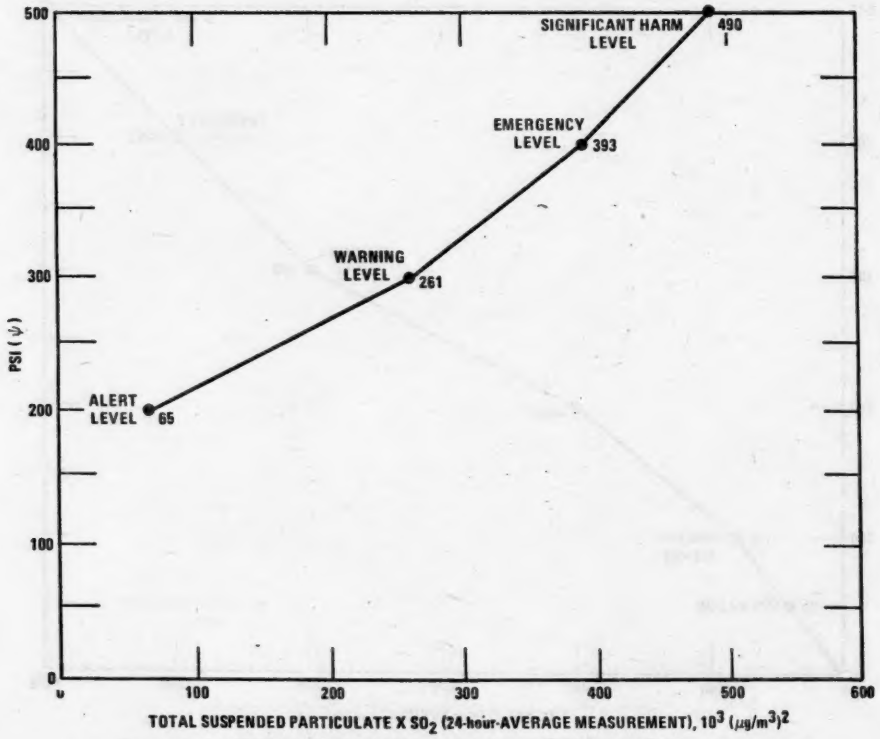

Figure 6. PSI function for product of total suspended particulate and sulfur dioxide.